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THE WORLD'S WEALTH

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Chapter 1

WHAT AND WHERE IS WEALTH?

To most of us wealth tends to mean simply “money”; a man is assumed to be wealthy when he has a sizeable amount of cash, either in his personal possession or held in custody for him at his bank. If he is able to spend ten dollars or two pounds sterling on a single meal, he is regarded as a wealthier man than the fellow who is hard put to it to find sixpence for a cup of tea and a sandwich, still wealthier than the peasant who must produce his daily bowl of rice from a few square yards of earth. The wealth or poverty of a nation, too, has frequently been judged on the amount of money it possesses, on the weight of the gold reserves it holds in its national bank. But all this kind of wealth—gold bullion, silver coins, or pieces of paper that represent certain quantities of such precious metal—is valueless unless and until goods can be obtained in exchange for it, it is as valueless if buried in the vaults of a national bank as in a man’s back garden, as the United States of America discovered during the years of depression. “Wealth,” in fact, only becomes actual wealth from the moment that it is exchanged for goods. If we agree to the commonly accepted definition of wealth, then, as the material manifestation of weal or welfare, it cannot be measured simply by so many tons of gold or silver, or so many slips of watermarked paper, the present-day scarcity of goods and the comparative abundance of money throughout much of the world provide sufficient evidence of this fact. Basically, wealth comprises the manifold resources of the earth which can be exploited and utilised by mankind, which can be transformed into the commodities of everyday life the most important, of course, being those which feed and clothe us, and give us shelter.

But the wealth of a community is not limited to the resources which it produces on its own territory If it has a surplus of these goods beyond the amount necessary for the people at home, it can exchange them for other types of goods produced abroad, and the farther the two communities are able to carry this process of exchange the greater will be the total wealth of each of them The existence of a home-produced surplus, in fact, does not spell wealth at all to a community unless it *can* be exchanged Some years ago a series of lavish crops of coffee provided Brazil, for instance, with a heavy surplus which could not be sold in the world markets, so that thousands of tons had to be systematically burned, meanwhile, American wheat farmers were destroying their surplus grain, and cotton planters were ploughing in their fertile earth And during this fruitful era the major proportion of the human race was suffering gravely from want The second factor that determines the wealth of peoples, then, is trade, and the vehicles by which trade is conducted, the means of transport, assume a great importance

Trade itself is by no means a new conception, thousands of years ago men were exchanging a limited range of goods On the other hand, the scope of world trade has expanded enormously in the last century through the development of mechanical power, and the efforts of the Egyptians and Phœnicians appear puny beside the journeys of our modern cargo ships, carrying thousands of tons of merchandise over thousands of miles of sea, and of our transcontinental railway trains, and more recently still of our freight air liners The very smallness of the means of transport available to the ancients restricted them from trading in any articles but those which were of great value and relatively inconsiderable size They did not cater for a more varied breakfast-table for the common man or any sort of rise in his standard of living, the products they exchanged were generally designed to increase the luxuries of the rich, and we find from historical records that gold, silver, ivory, ebony, scents, and gums figured largely among them By Greek and Roman times quantities of bulkier products, such as grain, were being traded, but then only within the Mediterranean area between countries that were easily accessible to one another by sea At the end of the fifteenth century the main articles brought from the East to Europe were still silks and spices, and again, a century later, silks, velvets, spices, dyes, scents, jewels, pearls, and similar articles of luxury In Shakespeare's time imported foodstuffs were still so much a luxury in England that in a rural district one pound of sugar, for instance, cost as much as twenty-eight pounds of home-produced veal or mutton Gradually, as the boundaries of trade extended, an ever-widening range of exotic products was appearing in the markets of the world, tea, coffee, and cocoa, unknown to the Englishman of four centuries ago, have now become the three leading beverages in world production, and along with many other commodities appear to-day in the homesteads of people living far away—oceans and continents away—from the areas where they are produced Development in the means of transport, more particularly through the invention of the steamship and the steam locomotive, has vigorously accelerated this revolution in the distribution of the world's wealth.

If all the peoples of the earth are to participate in and benefit from the distribution, the obstructions to the world-wide exchange of goods must be reduced to a minimum, for there are very great differences in the types of natural wealth obtained in the various geographical regions The Eskimo, who still scarcely comes within the scope of international commerce, is able to catch fish from his home waters in sufficient quantity to feed himself and his family, but it forms the principal and often almost the sole article of his diet, the nomadic Arab of the hot deserts receives a not much larger share of the world's wealth, and frequently has to breakfast, lunch, and supper and directly or indirectly practically all our food, drink, and clothing—closely follows the same classification No wanderer in the English New Forest, or the Yellowstone National Park of North America, for instance, would come upon teak growing in the heart of the woodland, nor would a Burmese discover an oak or elm in his domestic jungle Teak is a tree typical of the natural vegetation of the tropical forest, while the oak and elm are native to the deciduous forests of cooler lands Another group of trees, including the pine and the spruce, is found in the coniferous forests which thrive in a region still farther removed from the tropics Likewise, of the cultivated plants, rice is a food grown most abundantly in south-east Asia, for here the climate provides the essential heavy rains of the monsoons, while wheat, requiring a comparatively small rainfall and much lower temperatures, is the product of the intermediate grasslands of higher latitudes

In order to make this review of the world's wealth as systematic as possible, then, reference will frequently be made to each climatic region as being the home of certain types of natural vegetation To simplify the classification, the number of regions may be reduced to four tropical, sub-tropical, intermediate (sometimes misleadingly termed temperate), and polar Tropical areas are characterised, in brief, by hot weather throughout the year, and have no frosts save on the highest ground, so that as far as temperatures are concerned the growing season is continuous On the other hand, all parts of the tropics are not subject to excessively high temperatures, for the region covers both the hot desert—arid and almost plantless, where there are extreme changes of temperature from season to season and even from day to night—and the equatorial forest, with its constantly and monotonously warm, humid atmosphere and its luxuriant vegetation On the polar side of the tropics are the sub-tropical lands, which enjoy greater variety Their climate consists of a long, warm summer, the growing season, followed by a short, mild winter when frosts may occur Here the change of weather from summer to winter is sufficient to promote human activity and to render the region favourable to life, it is a region from which sprang many of the great civilisations of the past Between the sub-tropical and the polar region is the intermediate zone, where the summer is warm and frost-free and the winter is often much longer and is certain to bring frosts One of the features of this region is the high degree of changeability of the weather, which is generally supposed to evoke the maximum mental and physical endeavour, at any rate the intermediate climates have produced the dominant civilisations of the present age Of these four principal natural regions the polar is the least favourable to human existence, and indeed the severity of the climate is such that only along the fringe of the zone is life supportable The winters are long and intensely cold, the summers are short and only mild, and frosts may be experienced in every month of the year

Each of the main natural regions is sub-divided into two or more areas possessing certain distinctive characteristics of climate and vegetation In the tropical region, in addition to the hot, rainy equatorial forest and the arid deserts of little or no rainfall, there are the tropical savanna or grasslands, the monsoon lands, and the tropical highlands The tropical savanna lies around the frontier of the equatorial forest, and, as its name indicates, grass has now taken the place of the dense jungle as the typical vegetation Monsoon lands are included by some geographers in the savanna, but because they have a characteristic all their own—a reversal of prevailing winds as well as other climatic phenomena between the wet summer and the dry winter—it is more convenient to separate them Then the tropical highlands are different again, for the height of the land—from 2,000 to 6,000 feet above sea level—produces generally lower temperatures throughout the year and a greater diurnal range of temperatures The sub-tropics are usually divided into only two areas, the wet and the dry, the climate of the wet sub-tropical region is sometimes referred to as the Cotton Belt type, as this part of the southern United States is most representative, and for the same reason that of the dry sub-tropical region is often known as the Mediterranean type

To the intermediate lands four main sub-divisions are recognised the mid-latitude deserts, corresponding to, but naturally much cooler than, the hot deserts of lower latitudes, the intermediate grasslands, and two which may be most simply termed cool intermediate and cold intermediate, an alternative name for the last being the sub-polar region, where the coniferous forests occur On the poleward side of the intermediate zone is first the tundra, an area where, owing to the long, cold winters, only a stunted vegetation exists and is normally confined to mosses and lichens, and then the ice-cap, where there is no vegetation at all but, instead, a permanent covering of ice and snow

We may note that as we pass from any one of these natural regions into the neighbouring zone—from the equatorial forest, for instance, into the tropical savanna—there is no sharp line of demarcation between the two, as there is at a political boundary, the one region gradually merges into the other, the climate and the natural vegetation of the first assume more and more of the characteristics of the second until, finally, they have become those of the second We may also observe at this stage that within each of the zones occur quite appreciable local variations on the general type of climate and vegetation Probably the most noteworthy of these is caused by altitude, for increasing height above sea level, giving successively lower temperatures, has much the same effect on geographical environment as increasing distance from the Equator, in ascending a mountain in the tropics, for example, we should pass in turn through the same natural regions as if we were making a journey to the Pole, ending our climb at the snow-topped summit, the counterpart of the polar ice-cap

It is becoming fairly plain that each of the different climatic zones will have its own characteristic type of natural vegetation, and likewise will produce its own types of cultivated plant life or crops In some areas of the world rice is grown, elsewhere the main food crop is wheat, one region helps to clothe mankind by producing cotton, another wool Still other regions yield animal products in the form, perhaps, of mutton or beef, or butter and cheese, or furs—for the animal kingdom is so dependent for its food on vegetable life that animal species, both wild and domesticated, are found in the regions in which those types of food are available in other words, they are similarly distributed according to the climatic regions We will now pass on, then, to our study of the many varieties of wealth in relation to their geographical location, we will discover where the world's wealth lies, how it is utilised, where it goes, and by whom it is consumed having the oldest and most highly developed agriculture derive the richest harvests from their wheatfields. Two of these, Holland and Denmark, produce about four times as many bushels to the acre as India and Australia.

Wherever wheat is grown its cultivation is dominated by climate. A cool, moist type of weather is required during the early days of its growth, this determining the density of the stalks and being chiefly responsible for the final yield of the crop, then a warm, dry, sunny season is needed for the harvesting, and decides the quality of the grain. For at least three months there should be a frostless growing season, the ripening of the grain should take place in average temperatures of over 60° Fahrenheit, while the most suitable amount of rain is that normally provided by an annual fall of about 25 inches—approximately that of London. These requirements are best satisfied by the climate of the intermediate grasslands, which, lying in the heart of the great land masses of the northern hemisphere, are the true home of wheat, the granaries of the white races of mankind. In this region the rainfall is comparatively light and far short of the amount necessary for the growth of forests, as the name indicates, the typical covering here is grass, the distribution of the rain in the form of spring showers and early summer downpours being equally favourable for the growth of this kind of natural vegetation and for the cultivation of wheat.

Within the region two main classes of wheat are recognised, according to the season when the grain is sown, winter wheats (called in the United States "fall" wheats) and spring wheats. The winter wheats are sown in the autumn or "fall," lie in the soil throughout the winter, sometimes being protected from frosts by a layer of snow, and are reaped in the late summer. Where the severity of the winters is so great that the young plants would be destroyed by the intense cold, however, the wheats are not sown until the spring, and are thus known as spring wheats, again being harvested in the late summer.

Most typical of the intermediate grasslands are the prairies of North America, extending in a wide belt east of the Rocky Mountains from northern Alberta in Canada to northern Texas in the United States These immense rolling plains, where no tree can be seen in any direction, form the most important wheat-growing lands of the world Being shielded from moisture-laden westerly winds by the Rockies, their rainfall is quite scanty, and they experience a considerable range of temperatures from summer to winter In the north they gradually merge into the sub-polar region of coniferous forests Here the summer is short and only moderately warm, but winters are long and harsh, and fierce, destructive blizzards are suffered, being alleviated periodically and very temporarily by the warm chinook winds blowing down from the Rockies and melting some of the snow Through the seasons the scene changes from the fresh greens of springtime to the parched browns of autumn, and then the flat white expanse of winter So severe are the winters, in fact, that in the main Canadian part of the wheat belt—the provinces of Alberta, Saskatchewan, and Manitoba, which together account for over ninety-five per cent of the country's wheat acreage—as well as in the state of North Dakota, U S A , practically all the grain produced has to be of the spring-sown varieties The one exception in the area is south-west Alberta, where the warm chinook is regular enough to moderate the cold of winter and permit autumn sowing

Probably the worst weather hazard from the viewpoint of the wheat farmer, especially in the north-west, is the possible occurrence of a frost before the grain has been harvested To offset this, quick-ripening types of seed have been developed, while the bright sunny days of the Canadian summer, providing longer hours of sunshine than are known in any part of north-west Europe, have also contributed Another hazard is due to the uncertain character of the rainfall which fluctuates considerably from year to year On the drier prairies of southern Saskatchewan and Alberta nature has to be assisted by irrigation, but farther north the scanty spring rainfall is usefully supplemented through the melting of snow and of water which has frozen underground Well to the east of the three main prairie provinces, in southern Ontario, where wheat is still cultivated though now providing a very minor proportion of the total output, the heavy winter snows act as a protective covering against frosts, and winter wheats predominate

In addition to the climate, the physical character of the land made the prairie ideally suited to large-scale wheat production, and closely linked the economic development of Canada to this form of agriculture In the early days of expansion, the treeless plains offered an immense area of rich, virgin soil to the settler, who was thus encouraged to farm an unusually large amount of land Later the advantage of the size of these individual farms was seen in the employment of modern agricultural machinery, such as the great combine-harvesters for cutting and threshing, which were not an economic proposition on the smaller farms of other lands The relatively low yields per acre, compared with those obtained by intensive cultivation in parts of Europe, were of small account, and the Canadian wheat farmer rose to be the world's leading wheat salesman

The romantic story of the opening up of the west was the story of the movement westwards of the vast fields of golden grain, as the pioneers acquired fresh land and sowed and harvested an ever-increasing surplus of wheat for export to the dense populations of western Europe, whose farmers, even with intensive cultivation, could not provide them with sufficient daily bread In the van of the advance the railroad was laid, for a means of transport for the grain was as essential as a good climate and a fertile soil, and close in its wake followed the farmer Gradually, as the advance went on, the areas of highest wheat production shifted from Ontario to Manitoba, then farther westward again to Saskatchewan, till now Alberta, the most westerly prairie province, has reached second place in production, and Ontario has sunk to a minor position

In the first thirty years of this century the railroad mileage in the prairie provinces multiplied nearly five times, and the area of land under cultivation increased during the same period over ten times Parallel with this development new centres of population sprang up on the prairies and swelled often at an even more rapid pace, small collections of homesteads became thriving, busy townships At the beginning of the century Winnipeg had a population of something over 40,000 To-day, having for many years been one of the world's leading grain markets, it houses 222,000 people In 1901 there were just over 100 persons living in Saskatoon, in the heart of the wheatlands, ten years later there were over 12,000, after ten more years over 25,000, and now 43,000

From the wheatfields the grain is conveyed by road to the nearest rail point, is stored in massive elevators, then by far the greater proportion is transported to the ports of Fort William and Port Arthur, to be shipped through the Great Lakes waterway, and thence either to Montreal, Canada's leading city and great wheat and flour exporting centre, or to one of the north-eastern ports of the United States, there it is transferred to ocean-going steamers for the North Atlantic passage to Europe Of late years an increasing quantity has left the prairies by rail in a westerly direction, and has been exported across the Pacific from Vancouver, some of this ultimately finding its way to Europe via the Panama Canal

On account of her relatively sparse population, and in spite of the considerable fluctuation in the annual crop, Canada has always produced a large surplus over her domestic requirements and for many years wheat has been one of her most valuable exports, her main customer has been and still is Great Britain Before World War I Canada occupied third place among the foremost wheat-exporting nations, but by the early 'twenties, so great was the expansion of the prairie wheatfields, she had taken the lead, and was only displaced in the late 'thirties by Argentina

Southward over the United States border the climate of the prairies grows gradually warmer, the summers are longer and hotter and winters are shorter and milder, and at the southern extremity the grasslands are bounded by the wet sub-tropical region of the Gulf of Mexico Hence, except for the far north, the grain grown in the American part of the wheat belt is of the winter varieties As in Canada, the development of wheat cultivation followed the laying of the railroad, and commercial success was closely dependent upon its accessibility The areas of highest production of winter wheat in the United States lie in the states of Kansas and Oklahoma, though the grain is produced in the same latitude but to a much smaller extent as far east as the Atlantic coast Again, the wide expanse of available land led to large-scale farming, and the bulk handling of the grain that accompanied the mechanised agricultural methods, caused certain inland towns to assume the rôle of collecting centres comparable to Winnipeg in Canada Most of the spring wheat of the north is taken by the importing milling city of Minneapolis, while the winter wheat of the central states is dispatched to points such as Kansas City and St Louis It is this latter grain which provides about two-thirds of America's total crop and practically all the exportable surplus, much being shipped from the Gulf ports of New Orleans and Galveston

But, although the United States normally has second or third place among the nations in production of wheat—her total output exceeding that of Canada—and although her wheatlands form part of the same natural region as the Canadian prairies, from the standpoint of world trade her position is very different from that of her neighbour In the first place, she has an extremely large industrial population to feed, and thus about four-fifths of her wheat crop is consumed by the 132 million native Americans whereas the 11½ million people of Canada consume a relatively small proportion of their output, the majority being released for export During recent years, too, exports from the United States have fluctuated much more widely than those from Canada, and occasionally the country has actually imported wheat The main reason for these changes was intensified foreign competition, which made it impossible for the American farmers to sell their surplus in the world markets As a result huge stocks accumulated, and the outcome was that the American Government paid the farmers to plough in some of their land and so reduce the output

A still greater area of grasslands lies in a west-east belt stretching from Rumania and the Ukraine across southern Russia, north of the Caspian Sea and Lakes Aral and Balkhash to northern Mongolia, with an extension southwards through Inner Mongolia—the Eurasian steppes, counterpart of the American prairies, and another of the world's rich granaries Once more the natural covering of grass has largely given way to vast wheatfields The soil consists of the black earths, famous for their fertility, the rains of spring and early summer are favourable, but, as on the American prairies, the variation in their amount from year to year provides one of the chief hazards to successful farming Although, being so far removed from the moderating influence of the oceans, summers on the steppes are comparatively hot, winters are for the same reason so severe that over most of the region only spring wheats can be sown

By far the major proportion of the Eurasian steppes lies within the borders of the U S S R , and the place of this region among the world granaries has strikingly varied with the country's political history Before World War I, Russia led the field in wheat exports by an appreciable distance, but in the economic disorganisation of the Revolution her output fell severely, famine afflicted her own population, so that in the early 'twenties she had shrunk to a very minor figure in the wheat markets But the result of Socialist planning under the Soviet regime was that by the end of the ensuing decade she had risen to fourth place among world exporters, and had temporarily taken the lead in total production Massive collective farms had been organised by the State, the most up-to-date methods of large-scale mechanised agriculture had been introduced with the establishment of machine-tractor stations at centres such as Kharkov—not only was the nation enabled to purchase still more foreign machinery with her exported wheat, but the standard of living of her peasants was raised to a new level At the same time an integral feature of the Soviet plan was the industrialisation of the country The rôle of Soviet Russia as a world provider of wheat then began to resemble that of the United States, the greater part of her tremendous output was to be delivered to her own rapidly expanding industrial centres, while the remainder was available for the purchase of much-needed foreign manufactures

There is still ample scope for the extension of Russian wheatlands in the steppes of southern Siberia, but in view of the grave losses in production she has suffered during World War II in the Ukraine, her richest agricultural republic, it appears likely that for some years to come she will aim first at providing sufficient daily bread for her own people, and will leave supremacy in the world markets to the more sparsely populated nations One considerable drawback to the eastward extension of wheat production is the distance of the Siberian wheatfields from both internal and external markets, and the poverty in means of transport Most of the wheat is dispatched by the Trans-Siberian Railway, exports being shipped from Odessa and other Black Sea ports, while the more recent Turksib railroad enables grain to be sent into Turkestan, releasing useful land there for cotton production

Among the other important wheat producers, the crops of India and northern China are almost entirely consumed at home In India the cereal is principally grown in the north-west during the cool season with the help of irrigation, though cultivation is spreading southwards over the Deccan Both in China and Japan the demand for wheat has been rising steadily of late years, and with respect to the future economy of China it may be noted that there is probably as much room for expansion in production in Manchuria as anywhere in the world Wheat is also produced in large quantities in the drier, warmer areas of the cool intermediate region of Europe and in the sub-tropical Mediterranean region Here France has the greatest area under wheat, and still imports more, especially from her North African possessions of Morocco, Algeria, and Tunis Much wheat is cultivated, too, in southern Germany, and in Italy and Spain. A most popular form of wheaten foodstuff in Italy and other Mediterranean countries is manufactured from the grain as a tubular paste, and sold as macaroni, vermicelli, and similar commodities

But for the two countries which, with Canada, do most towards supplying the industrial nations of Europe with the wheat in which they are deficient, we must turn to the southern hemisphere Around the Rio de la Plata in South America is a semicircular area, known as the pampas, which has a climate and natural vegetation similar to those of the intermediate grasslands of the northern hemisphere being nearer both to the Equator and to the moderating influence of the sea than are the Canadian prairies, its climate is warmer and also more equable, and approaches rather more closely to that of the wheatlands of Kansas and Oklahoma Rainfall over this region decreases quite rapidly from north-east to south-west, where it passes into the desert of Patagonia, and it is a drier, somewhat cooler, belt of land on the circumference of the semicircle—the so-called "wheat crescent"—which has become another of the world's foremost granaries In the early days the pampas comprised an area solely of open grasslands, and on the large estates cattle and horse rearing was the main occupation Then, with the entry of hundreds of thousands of immigrants, mainly from southern Europe, into the Argentine, the estates were broken up, fields of grain began to take the place of pastures, many of the picturesque "gauchos" or cowboys, like their North American prototypes, were ousted towards the drier lands to the west

Argentina, like Canada, has a relatively small population, so that practically the whole of her large wheat crop is available for export, and in the late 'thirties, after taking second or third place for many years, she wrested the lead among wheat-exporting nations from Canada Like Australia, the second great wheat producer of the southern hemisphere, Argentina possesses a notable economic advantage in her geographical position Situated south of the Equator, her seasons are the reverse of those in the northern hemisphere, her crops are harvested during the northern winter, and she is thus able to ship her surplus to the major consuming centres of the northern hemisphere at a time when their stocks are running low The country is well served with a railroad network radiating from the two main exporting ports of Buenos Aires and Bahia Blanca, and the chief transport problem is the conveyance of the grain from farm to railroad, for in a land where stone is scarce, road-building is a costly enterprise Again, facilities for storing the wheat are not always of the best, and sometimes the mass transportation of wheat to the markets causes prices to be depressed to levels which are uneconomic to the farmer On the other hand, these difficulties will doubtless be overcome, and, with so much grassland still available for wheat cultivation, there is every prospect, given a fair external demand, of her output being amply increased

Commercially, Australia enjoys the same good fortune as the Argentine in being able to market her surplus grain early in the year Her wheatlands lie within the intermediate grasslands of the Murray-Darling basin, covering part of the states of New South Wales and Victoria, and two smaller areas in the south-east of South Australia and the south-west of Western Australia having a dry sub-tropical or Mediterranean type of climate Wheat occupies more than half the cultivated land, and is by a long way the most important crop In comparison with the other principal wheat exporters, Australia is handicapped by her great distance from the European markets a climatic hazard is the uncertainty of the rainfall, but this has been largely counteracted by the practice of "dry farming" By reason of the smallness of the population, more than half of the total output is normally liberated for shipment abroad, her export trade has increased remarkably since World War I, till she has become third among the exporting nations, and there is still scope for extension of her wheatlands

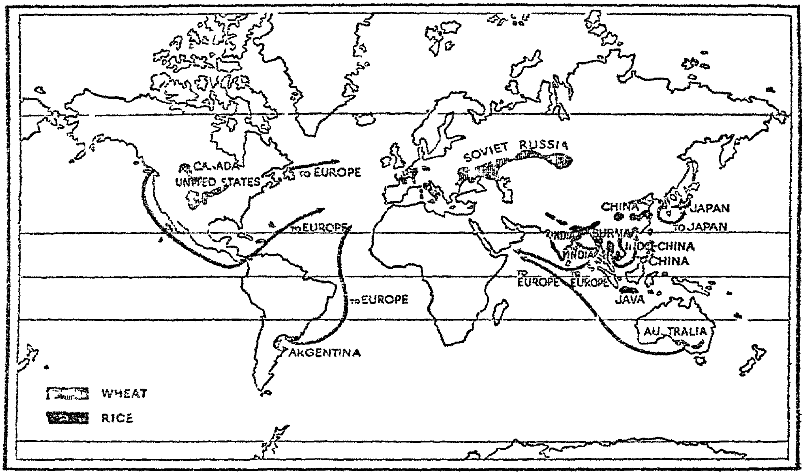
Despite the fact that approximately one-third of the world output of wheat and wheaten flour is grown in Europe, the great bulk is destined for home consumption, and the needs of the densely populated nations of the western part of the continent are so gigantic that the total amount absorbed comprises over half the world output Most of the balance, as we have observed, is carried to Europe by the three trans-oceanic routes from Canada, Argentina, and Australia, whilst the principal consumer, by far, is Great Britain Even with intensive cultivation, and, possibly, with the help of artificial stimuli to domestic wheat-farming, the peoples of western Europe are utterly unable to produce sufficient daily bread to feed themselves, and heavy demands will continue to be made on the three leading exporting nations much more adaptable with regard to soil and climate than wheat, it thrives in poorer soils, and in a wider range of temperatures and a lower rainfall—but it is less tolerant of excessive moisture As a result, barley may be found growing far north within the Arctic Circle and also in the tropics, on mountain slopes and the high plateau of Tibet as well as on the plains, and is the last grain crop that can be raised where semi-arid lands merge into the desert The areas of heaviest production lie in central and eastern Europe, and the export trade, which has shrunk considerably during recent years and changes hands from year to year, is usually dominated by Rumania, Soviet Russia, and Argentina The importing nations, again, are in north-west Europe—Great Britain, Holland, Belgium Germany, and France

Barley is only regarded as a major foodstuff in regions where wheat or rye cannot be cultivated—in the cold of northern Scandinavia or in the arid parts of north-west Africa Wherever wheaten bread is the "staff of life," barley is principally used for human consumption in the manufacture of alcoholic drinks, and secondly as a forage for livestock Nations that consume the most barley, such as Great Britain and Germany, are, in general, the heaviest beer-drinkers, for barley is the chief raw material of the brewing industry the grain is allowed to germinate, is then killed, and the malt thus produced is fermented In Scotland and Ireland barley is used in whisky distilling

Oats are another cereal that we should find growing in, and near, the wheatlands of the world, though they are not a successful crop in the tropics or sub-tropics, they flourish, in fact, in the cooler, damper areas of the intermediate wheat belts They have become the principal grain in parts of northern Europe, for example in Scotland, Ireland, and Scandinavia, and there oatmeal has for long been an important article of diet in the form of porridge or oatcakes Elsewhere, however, oats are consumed mainly as a fodder for cattle and horses, both the grain and the straw being utilised A remarkable quantity of the grain is produced every year, very considerably exceeding that of barley, yet no more than two to four per cent ever enters international trade, one reason for this is its value as an animal feed, another its great bulk in relation to its weight—which discourages transportation. Hence the oat crops are absorbed almost entirely on the farms of the countries where they are harvested Areas of highest production are situated along the northern edge of the Russian wheat belt, in North America in a region on the north side of the Corn Belt—Iowa being the leading state—extending northwards into the spring wheatlands of Minnesota and the Dakotas and into southern Ontario, Canada, and across northern Europe from Iceland to the Baltic states Of the relatively small amounts that are exported, Argentina provides the bulk, and the main importers are the countries of western Europe, led by Great Britain During the recent war, of course Great Britain increased her domestic production of oats and other cereals, the output of wheat, for instance, being more than doubled by 1944

Those of us who enjoy our daily quota of good wheaten bread seldom realise, perhaps, the significance of other kinds of food to other peoples Rye, for instance, forms the basis of the much less palatable "black bread," the staple foodstuff of the peasants of eastern Europe Its chief asset, and the reason for its extensive cultivation, is its hardiness it flourishes in much poorer soil than wheat, and in a cooler and damper climate Almost the whole of the rye produced is both grown and consumed on the European plains, from Belgium to eastern Poland and in central European Russia north of the wheatlands, in a cool intermediate climate, and as far north as the southern edge of the coniferous forests Soviet Russia alone is responsible for practically half of the world output As long as the peasantry of eastern Europe are so cruelly poverty-stricken, they will be forced to cultivate rye for "black bread" on their infertile soil, one of the first signs of a higher standard of living would be a transference to wheaten bread in their diet

The grain which most probably feeds a larger number of the human race than any other is rice, the characteristic crop of the wetter parts of south-east Asia, and the staple diet of the wheatless multitudes of that area Although for convenience we sometimes classify these countries of the Far East together as monsoon lands, for they all experience a similar seasonal change due to the incidence of the monsoons, we should note that their natural regions extend from equatorial forest in the south (Dutch East Indies) to wet sub-tropics in the north (southern Japan), and that the latter is the farthest extra-tropical limit of rice cultivation Rice is a crop that requires not only high summer temperatures for the ripening of the grain, but also an abnormal amount of moisture during growth, and it is, therefore, in areas which either receive very heavy rainfall, or possess an abundant supply of water for



The principal world granaries, and the routes by which surpluses are shipped from the exporting countries irrigation, that it is most successfully raised Of the first may be mentioned the coastal strips of western and south-east India, Ceylon, Java, the Philippines, and Indo-China, all of which have heavy deposits of rain from the summer or winter monsoon or both, of the second there are the valleys and deltas of the great rivers, the Ganges and Brahmaputra of India, the Yangtse Kiang and Si Kiang of China, the Irrawaddy of Burma, the Menam of Siam, the Mekong and Song-ka of Indo-China

Rice is, indeed, a unique grain, for it requires water *on* as well as *in* the soil, and so has to be grown in flat, swampy fields One type, known as "upland rice," is the exception, for it is cultivated on non-irrigated hill slopes and relies for moisture entirely on a heavy rainfall, but yields are low and at the best precarious, and it is of comparatively minor importance In the cultivation of swamp rice the paddy or rice fields are flooded and the soil ploughed into a soft mud, usually with a small wooden implement drawn by a couple of lumbering water buffaloes On the plains and the river deltas, the retention of water in the paddy fields presents no difficulty, and conditions are ideal for cultivation On hill slopes, however, as in the interior of Java, Ceylon, and the Philippines, the ground has to be terraced, and each individual field—perhaps only a few feet in width—must be meticulously levelled off and banked so that the young rice plants are continuously covered with water for some weeks, the water is led or pumped in at the top, then carefully channelled from one terrace to another down the slope till it reaches the bottom One field is always held as a "nursery," and from this the small plants are transplanted by hand into the main paddy fields Growth is extremely rapid, often several inches in twenty-four hours, and, given the requisite hot weather, so is the ripening, so that over much of south-east Asia two crops are normal The final stage, the harvesting, is again carried out by hand

Through every process of this rice cultivation an immense amount of human labour, assisted merely by the most primitive implements, is expended, involving not only the peasant himself but in addition every member of his family It is a crop which provides rich yields and thus feeds a dense population, but it likewise demands the labour of a prolific community, whose livelihood entirely depends upon its success Nowhere else in the world can so many human beings be so firmly bound to the soil as these teeming millions of peasant cultivators to their paddy fields, laboriously they turn the wet soil—sometimes, in China, they fertilise with their own excrement—for many hours a day during the growing season they and their wives, sons, and daughters stand, bent-backed and bare-footed, in inches of water, for little better than bare subsistence Nowhere else in the world can so great an effort reap so small a reward

By far the greater proportion of the rice crop is cultivated and consumed on the peasant smallholdings, and no more than three or four per cent enters the world markets Most of this commercial rice is merely conveyed from one country in the Far East to another, the source and destination vary from year to year according to the harvests, those areas which have a surplus exporting to repair the deficits of others In general, however, the countries of densest population are those which usually have to import China, producing the largest quantity of rice—sometimes over half the world output—has to purchase still more and so likewise does India, the second leading producer The regions which regularly have a considerable surplus for disposal are those with a relatively thin population, Burma, Siam, and Indo-China, the grain, which is grown in the great river valleys and deltas of these countries, is shipped from the ports of Rangoon, Bangkok, and Saigon Most of this exported rice is sent to China, India, Ceylon, Malaya, and Japan—which also draws large amounts from Korea—while the remainder is distributed fairly evenly to the rest of the world

Among the inhabitants of many of the drier areas of India and China, where the population is far less dense, millet forms the staple food, being cultivated usually on soil which is too poor for wheat This grain thrives only where the rainfall is less than the minimum required for rice, and the areas of heaviest production are the interior of the Deccan, especially inland from the Western Ghats, where the rainfall diminishes quite rapidly, and in northern China and Manchuria Practically the whole crop is consumed locally by the Indian and Chinese peasants

Chapter 3

SUGAR AND SPICE . . . .

IN the ancient world the proverbial "sweet tooth" must have been a tantalising possession, for it could only be indulged with honey and perhaps the juices of certain trees, sugar, in fact, was unknown to the early civilisations of the west The probable reason for its late introduction to our ancestors is that the coarse sugar of India, where it is said to have originated, deteriorated too rapidly for the long journey Even as late as the beginning of the eighteenth century it was a relatively rare commodity in Europe, yet to-day it is regarded as one of the necessities of life in almost every country in the world Sugar is now obtained from two vegetable sources, the sugar-cane, from which it was originally produced, and the sugar-beet, from which it was first manufactured towards the end of the eighteenth century In the period just preceding World War I the production of beet-sugar had nearly equalled the output from cane, but since then the cane has been the main raw material

Sugar-cane, like the cereals, is a type of grass, growing to a height of eight, ten, even fifteen feet, unlike the cereals, however, it is not the seed for which it is cultivated, but the sweet juice contained in the stem Most varieties have a long growing season of twelve months or more, and during this period the plant must not be subject to frosts This limits cultivation, of course, to the tropical and sub-tropical regions Further, while the cane is growing it requires an abundant supply of moisture, either in the form of rain or by irrigation, and continuous hot, sunny weather The one change in weather conditions that it does demand is a slackening of the rainfall at the time of ripening, for the effect of excessive moisture then is to dilute the juice and so reduce the sugar content of the cane A climate which is perpetually very wet as well as hot is not therefore adequate, and cultivation in the depth of the equatorial forest, such as in the basins of the Amazon and the Congo, is impracticable. Ideal conditions for growth occur in the region which we may regard as being just within the equatorial forest, but very close to the boundary where forest is passing into savanna or grassland; here the weather is always extremely warm and humid, but the area is just sufficiently far removed from the Equator for a marked seasonal rhythm of weather There is, in other words, a short "dry season" suitable for the production of a juice rich in sugar

From the standpoint alone of climate, Cuba and other West Indian islands are ideally suited to sugar-cane production, all the conditions of heat, sunshine, humidity, heavy rainfall, and a brief, drier ripening season are fulfilled, and in addition the soil is fertile and land cheap and plentiful, and the roots continue to shoot after the cane has been cut for several years in succession At the harvesting a great deal of manual labour is demanded for the cutting and handling of the cane, and this is mainly supplied by negroes, the descendants of former slaves Being a bulky crop, sugar-cane requires, too, an efficient system of transportation, and this is facilitated by the division of the land into large units rather than smallholdings, sugar-cane has become pre-eminently a plantation crop Again, the machinery for the rather complex processes of extracting and refining the sugar is very costly, well beyond the means of native cultivators, and the industry is largely in the hands of financially powerful corporations few industries provide a more striking instance of the provision of capital by the white man whilst the native supplies the labour

Development of the cane-sugar industry in Cuba has been effected by American capital, and favourable climatic conditions, coupled with the preference given to her sugar in the United States, have caused such expansion that this island has been for many years first among the exporting nations and second in production Most of the sugar is purchased by the United States in the raw state, and is refined near to the port of entry In spite of her not inconsiderable domestic production of cane-sugar in the wet sub-tropical area of southern Louisiana, and her still greater beet-sugar production, the national consumption is so enormous that, in addition to the imports from Cuba, the country purchases the bulk of the crops from the American plantations in Puerto Rico and the Dominican Republic Likewise, Great Britain, besides consuming her own beet-sugar production, draws upon the cane-sugar exports of the British West Indies, including Jamaica and the group of smaller islands known as the Lesser Antilles and Cuba and the Dominican Republic

In more than one instance the cane-sugar trade seems to have followed and kept fairly close to the Imperial flag Besides her imports from her West Indian spheres of influence and her dependency of Puerto Rico, the United States purchases also from the Philippines and Hawaii Great Britain, second to the United States in sugar imports, draws upon many of her Dominions and Colonies in addition to the West Indian islands Australia (Queensland), South Africa (Natal), Mauritius, Fiji, British Guiana—home of Demerara sugar In accordance with the policy of a White Australia, Queensland has the distinction of employing no native labour on her plantations, yet she still manages to produce sufficient sugar for the needs of the whole Commonwealth and leave a surplus for export Since their possession of Formosa, or Taiwan, the Japanese had widely extended the sugar plantations, and by 1938 had raised the island to the position of fourth world producer and one of the leading exporters Production in Java, another Far Eastern island to become an important sugar exporter, was stimulated by the Dutch, and higher yields were obtained than anywhere else in the world The country that normally produces more sugar than any other is India but the entire crop is consumed, mostly in the form of unrefined brown sugar, and still more has to be imported from Java

It might be thought that the combination of features favourable to sugar-cane cultivation enjoyed by the West Indian islands, in particular Cuba—ideal climate, plenty of flat, fertile soil, and a good position for trade with the great consuming nations—should guarantee them prosperity for all time But it was just these natural advantages that brought economic distress to the inhabitants, planters and labourers alike, for they had been thereby encouraged to devote their land entirely to cane-growing, so that when the external sugar markets shrank, they had no alternative commodity for sale and were faced with disaster In the years before World War I, competition from beet-sugar produced in the intermediate lands, especially in Europe, was already being felt, but during the post-war era the demand for cane-sugar increased so tremendously, owing to the wartime dislocation of the beet-sugar industry among the belligerent nations, that Cuba and her neighbours soared to unimagined heights of prosperity Prices were high, more and more land was cleared and more plantations opened Then, in less than a decade, the first large crops of sugar-beet had been harvested, the industry had been fully restored, the demand for cane-sugar was suddenly reduced, prices fell calamitously, stocks accumulated, the new plantations became redundant, and the inevitable slump followed During the latter part of the inter-war period Cuba, though still the leading exporter, only produced cane-sugar to a fraction of her capacity Together with a few minor producers, she could have supplied the whole world with sugar at prices far lower than the consumers were paying, but many governments insisted upon protecting and stimulating their native beet-sugar industries, and restricted their purchases of cheap cane-sugar

There are few plainer examples of the way in which economic nationalism can affect the distribution of the world's wealth than this rivalry for markets between cane-sugar and beet-sugar On the one hand, the cane is cultivated on tropical islands principally for the export trade, whilst beet-growing is limited to the intermediate zone, and is practised chiefly by the industrial nations for home consumption Northern and central Europe comprise the main beet area, most of the sugar coming from the U S S R and Germany, with France, Great Britain, Czechoslovakia, and Poland also important producers; the United States has a large output, and normally takes third place in world production In addition to her own much-increased cultivation, before World War II Great Britain was purchasing large quantities from other European countries

In comparison with the sugar-cane industry, beet-growing has certain disadvantages—it demands a high fertility of soil, a moderately warm summer but ample rain, re-planting of the crops each year, the extensive use of fertilisers to repair the resulting soil exhaustion, and much manual work in the fields in areas where labour is expensive On the credit side, beet is now generally richer in sugar content than the corresponding weight of cane, the markets for the finished product are close at hand—in the main no farther away than the national frontier or at most a neighbouring European country—and fertilisers are readily available Furthermore, after the extraction of the sugar, the beet-pulp serves as a valuable by-product, either as a fertiliser for the beet-fields or, with the beet-tops, as a cattle food, whereas when sugar-cane has been crushed the refuse is used simply as fuel On the whole, however, the cost of beet-sugar production is much higher than that of sugar manufactured from cane, and State protection is necessary if the industry is to flourish What of the future? Will governments persist in artificially stimulating a national industry against geographical facts and the bounty of tropical nature, or will co-operation succeed competition and some international agreement be reached on the most advantageous production and distribution of this item of the world's wealth? In the light of the devastation of the sugar-beet industry of continental Europe during World War II, it may at least be predicted that the cane plantations will experience a second post-war boom

From sugar to spices from a commodity that was not even known to the ancients, but has assumed international importance—to a group of commodities that has declined from prominence and value to comparative insignificance in world trade In the minds of most of us living in the higher latitudes, spices are invariably associated with the tropics, and it was in that region that they originated and were used many centuries before they reached Europe After they had been introduced from the East, they soon became popular with those rich enough to afford them, possibly because, in an age that knew not the blessings of the ice-box or the refrigerator, they helped to modify the sometimes dubious character of the meat To some extent this trade was involved in the first steps to Empire-building, and, although the luxury product of medieval times has become a cheap commodity common to every kitchen, and the amounts entering world trade are immensely greater, a large proportion of them still comes from the British and Dutch possessions in the East Indies

The best known, pepper, is a climbing plant which is cultivated on a large scale in gardens; the fruit consists of red berries which when dried give black pepper, while white pepper is obtained by steeping the peppercorns, or berries, in water and removing the pulp from the seeds contained in them. Pepper requires a hot, humid climate, and the plant is mainly cultivated in the Dutch East Indies, in Malaya, and on the Malabar coast of India; much of the trade from the Far East comes through Singapore, while the historic spice port of Malacca is now scarcely used

Ginger is derived from the root of another tropical plant that originated in south-east Asia, and is cultivated in southern China and the East Indies, and has been successfully grown in Jamaica The Moluccas, a group of islands also in the East Indies, were the home of cloves, but most of the export trade is now held by the two islands of Zanzibar and Pemba, off the east coast of Africa Of the two types of cinnamon, the superior is chiefly cultivated in Ceylon, and the bulk of our supplies comes from that island To obtain the spice, small branches of the tree are cut, and the bark is stripped off and dried

In the same tropical region in which sugar-cane is cultivated grows the African oil-palm, its habitat, however, is the equatorial forest, for it only thrives in a climate that is constantly hot, humid, and rainy—best of all on the edge of the forest, where there is plentiful sunshine Throughout West Africa, from Senegal to Angola, the trees abound, and the valuable palm-oil that they provide is obtained from the fruit, which grows in huge clusters—many hundreds to each bunch Usually, the natives have protected the trees from felling, for the fruit has provided them for long ages with food Nowadays, a great deal of the oil is exported, in addition to the amount consumed locally, it is compressed from the "flesh" of the fruit by rather primitive native methods—often by nothing more scientific than the bare feet—and sold for manufacture into such products as soap and margarine The hard kernels are also a source of oil, and are exported and utilised particularly in the margarine industry All the West African countries are producers of palm-oil and palm-kernels, but Nigeria is easily the world's leading exporter, mainly to the industrial nations of western Europe and the United States, and the two products together are the country's most fruitful source of revenue Competition has lately been felt from the well-ordered plantations of the Dutch East Indies, which specialise in exports of the oil, and has been enhanced by the greater crudity of the West African product, the wasteful native methods of production, and the difficulties of transportation.

In the same natural region of equatorial forest, and requiring similar climatic conditions, grows the coconut palm, which, to the native, is all but "universal provider," for it yields him food, drink, and, to some extent, clothing and shelter, and to the world's industrial communities has become another valuable source of vegetable fats To the people of cooler climes its graceful shape symbolises the South Sea island scene It does thrive best near to the ocean, and it does grow extensively on tropical Pacific islands, but as far as modern commerce is concerned its main habitat is some of the larger but more thinly populated islands of the Dutch East Indies, such as Celebes and Sumatra, and the Philippines From the nuts the outer fibre, or coir, is stripped away, and is manufactured into matting Then the nuts are dried, and it is in the form of the dried "flesh," known as copra, that the fruit principally enters the world markets, the coconut oil is expressed from the copra, and, once more, is utilised by the margarine and soap industries, the residue being converted into cattle food, while relatively minor quantities of the dried meat are shredded and are consumed in confectionery as "desiccated coconut" The growing of the coconut palm has been left in the hands of the natives, for scientific methods are not essential, but the commercial product, copra, is again consumed entirely by the United States and the industrial nations of western Europe

Ground-nuts, otherwise familiarly known as peanuts or monkey-nuts, are another source of vegetable oil The plant, a member of the pea family, flourishes in the drier areas of tropical and sub-tropical lands, and China, India, French West Africa, and Nigeria have become the leading exporters Cultivation of the soya bean has also been stimulated by the demand for its oil, mainly in eastern Asia, though it is consumed in various forms as food by the local inhabitants, after extraction of the oil, which again is absorbed by the margarine and soap industries, the bean meal is used as cattle food or as a fertiliser In its numerous varieties, the soya bean can be grown in tropical, sub-tropical, or intermediate regions, but it has reached its most extensive production, both for consumption and export, in China and Manchuria Recently the United States has also become one of the leading world producers, her output having expanded nearly ten times in as many years.

ORCHARDS OF THE WORLD

The most important of all the vegetable oils is obtained from the olive, the fruit of a tree that probably originated in south-west Asia, and occupied such a prominent place in the lives of the ancients that a gift of olives, the "olive branch," became the recognised symbol of peace The tree is typical of the vegetation of the dry sub-tropics, the area which is frequently referred to as the Mediterranean region, being most widely represented by the countries surrounding the Mediterranean Sea, and rarely is it found elsewhere This dry, sub-tropical region, lying at a greater distance from the Equator than the tropics, experiences cooler, more temperate weather, and another notable difference is the seasonal variation from summer to winter Weather, in general, is remarkably pleasant, summers are long, sunny, and very warm—even hot on the southern side of the region—while winters are short and mild and provide sufficient rainfall to promote plant growth This sort of climate is reflected in the natural vegetation, which consists mainly of small evergreen trees and shrubs, but the plants have to protect themselves against excessive loss of moisture during the summer droughts many are provided with small leathery leaves, while the orange has its leaves covered with wax, and the olive with fine hairs

There are several features of the olive tree that recommend its cultivation in Mediterranean lands. it is hardy, although slow of growth it yields a rich harvest of fruit for many years, and it does not require irrigation, on this last account it is often found growing on hill slopes Harvesting takes place when the winter rains commence, about November, and, if a high quality of oil is to be produced, the fruit must be picked by hand and handled with extreme care Some of the olives are consigned to table use in the form in which they leave the tree, but by far the greater proportion are used for the production of olive oil, which is expressed from the "flesh" of the ripe fruit, only oil of inferior quality, however, is sold for soap manufacture

Within the Mediterranean lands olive oil is an essential part of the human diet, for it takes the place of animal fats The climate is so much drier than in the intermediate region immediately to the north that the raising of livestock is more difficult. such commodities as butter and lard are relatively scarce, and this very effective substitute is consumed The fact that, in general, an abundance of the essential foods may be produced in the Mediterranean region has led to the existence of fairly dense populations, and the latter in their turn have maintained a heavy demand for olive oil In Spain and Italy together the trees are numbered in hundreds of millions, so that these two countries, with Greece, supply about three-quarters of the total world output Olives are grown extensively, too, in the lands bordering the southern and eastern shores of the Mediterranean, and Tunis, Algeria, Turkey, and Syria, as well as Portugal at the western end, are all prominent producers But areas which occupy a similar position to the Mediterranean countries—approximately the same latitude north or south of the Equator and on the western side of a land mass—enjoy a similar climate, and, therefore, possess the same type of natural vegetation. Of these "younger" Mediterranean lands, California has a small output, and the fruit has also been cultivated in southern Australia.

So many fruits, in addition to the olive, come to us in the fresh, dried, or canned state from Mediterranean lands, that we may well term them the "orchards of the world." Our list might begin, for instance, with grapes, the citrus fruits—orange, lemon, and grapefruit—prunes, apricots, and figs. Grape culture is practised in each individual Mediterranean region: the Mediterranean area itself, California, central Chile, South Africa, and southern Australia, the major part of the world's supply goes into the manufacture of wine, but where the grapes are not suitable for this purpose they are sold as fruit. The vine is not strictly limited to the Mediterranean region, however, if its climatic requirements are satisfied—a prolonged hot, dry summer with plenty of sunshine, and rain too light to cause dilution of the juice. In Europe, its range extends in some areas—for instance northwards down the Rhine valley—well into the intermediate zone. Against summer drought it is equipped with an exceptionally long root, which enables it to draw water from a considerable depth, and the same appendage protects it against winter frosts, but it is peculiarly subject to pests such as the insect phylloxera.

Dried grapes figure largely in the exports of many dry sub-tropical countries, certain varieties being converted—either by mechanical means or by simple exposure to the sun—into raisins. In the Old World, Spain is still an important source of raisins, but in total production California has taken the lead. The smaller seedless grapes which are dried to become sultanas are chiefly grown in Asia Minor and the islands of the Aegean Sea, and are exported from Smyrna. Cultivation of the even smaller currant grape was practically monopolised by Greece, largely because of the unusually exacting requirements in climate and soil of this variety of vine, and currants have been for many years the most valuable of Greece's exported goods, the name "currant" is a corruption of Corinth, the port from which the fruit was shipped and in the vicinity of which it was first grown on the mainland

But the main purpose of grape culture is the manufacture of wine, that beverage which has made glad the heart of man over as many centuries as the daily bread has assuaged his hunger One of the world's oldest industries, frequent reference to the product in the Old Testament reveals its ancient popularity in Mediterranean lands—probably due as much to shortage of wholesome drinking water as to taste for the liquor, a factor which to some extent governs its consumption in many areas even to-day. In many Mediterranean countries, such as France, Italy, and Spain, wine may be regarded, in fact, as the national drink The type of wine produced is determined by characteristics of climate and soil as well as by methods of manufacture, and different localities have become celebrated as the homes of certain well-known varieties, the distinction between "dry" and "sweet" wines simply depends upon the fact that for the former the grape juice is entirely fermented whereas for the latter the fermentation is stopped when the sugar has only been partially converted into alcohol

Champagne and Burgundy the two French provinces, gave their names to the world-famous wines in which they specialised, and claret is pre-eminently the product of the Bordeaux district In Italy chianti has been produced principally in Tuscany, sherry is a corruption of the name Jerez, the town in south-west Spain where it is manufactured, the valley of the Douro in Portugal produces port, the German hocks come from the middle Rhine valley, and moselles from the basin of its tributary of that name Fortunate as they are in having the best wines produced at their doorstep, the bulk of the population of these countries do not, however, use an expensive wine list at every meal In France, the country of greatest production, consumption, and exports, most of the wine drunk is of the common "red" or "white" type—the *vin ordinaire*, and when there is an insufficient supply of these inferior wines produced in France, more is imported from Algeria Most of the exported wines travel no farther than north-west Europe, but in Great Britain tariffs giving preference to Empire products from Australia and South Africa have provided competition for the wines imported from France, Spain, and Portugal

Strictly speaking, the citrus fruits belong rather to the wet sub-tropics and the monsoon lands than the Mediterranean region, for the orange is believed to be a native of China and the lemon of India But it is in the dry sub-tropics, with the help of irrigation, that they have attained maximum cultivation, especially in the "newer" areas, and the California citrus industry has the reputation of being the most efficiently organised agricultural enterprise the world has yet known From the Far East the bushy, evergreen orange tree was first brought to the Mediterranean area, and Spain, though surpassed in total output by the United States, has long been the leading source of supply to the outside world Her groves, mainly situated along the Mediterranean coasts, yield both sweet and bitter oranges, the former by far the more important, the latter being produced for manufacture into English marmalade Of the many other Mediterranean countries which produce oranges, Italy and Palestine are noteworthy, while expansion is promised in Brazil, where the popular navel orange, a variety successfully produced in California, can be marketed during the northern summer

Supremacy in production of lemons is still held by Italy, all but a small proportion being grown in the island of Sicily, followed by the United States and Spain This fruit, like the orange, requires a mild, sunny climate with abundant moisture, and precautions have to be taken against both frost and fungoid diseases, world production had become almost static, but the health-giving qualities of the fruit will doubtless maintain a high demand. The grapefruit is a much later entrant into the citrus industry than the orange or the lemon, and has become more typically a product of the newly developed sub-tropical areas. Public taste for the fruit, however, has increased rapidly, especially in the United States, where Florida, on the wet sub-tropical side of the country, is the main area of production. Citrus fruit-growing has expanded considerably in the Mediterranean areas of South Africa and Australia—in each case the southern coastal fringe—exports being mainly within the Empire, but cannot compete in total production with the gigantic citrus industries of California and Florida.

A number of trees yielding fruit of great commercial value are of the deciduous type that is, they shed their leaves in the winter. Of those coming from the Mediterranean region, several, like the grapes, are sold in distant markets after being dried, a preserving process which is facilitated by the wealth of sunshine. In Europe, the prune, a type of dried plum, is grown most successfully on the cooler, moister edge of the region, and the Dalmatian coast of Yugoslavia is the area of highest production; but again the lead in world output has been taken by California, and prunes have become the most important dried fruit exported by the United States. The fig, one of the earliest cultivated fruits of the region, is native to the eastern Mediterranean, and is grown extensively on the coastal areas of Asia Minor, Turkey is therefore the main exporting country, and Smyrna the port from which the fruit is shipped. In the countries where the figs are grown they are eaten as a fresh fruit, but in the rest of the world they reach the table in the dried form. So, too, do Syrian apricots, and the need for cheap labour for the packing of the fruit has not impeded a great expansion in the production of both figs and apricots in the "newer" Mediterranean lands of California, South Africa, and southern Australia.

But the factor which contributed most to the wider cultivation of such fruits as apricots and peaches was the invention of the tin can as a means of food preservation, and in these highly progressive lands the canning industry has become an inseparable adjunct to fruit-farming Along with Empire wines, increasing quantities of fresh, dried, and canned fruits from South Africa and Australia are being purchased by Great Britain

Of the nuts, the almond, walnut, and chestnut all probably originated in the eastern Mediterranean, and are now exported from countries farther west within the region Fruits which are grown predominantly in the cooler intermediate lands include apples and pears, of which the former are the more important from the viewpoint of trade Despite the large number of apple orchards in Great Britain, vast quantities of apples are imported from Canada, the United States, Australia, and Tasmania

The one fruit native to the tropics which has found its way undried and unpreserved into the normal diet of most extra-tropical nations is the banana At all times it is one of the thirstiest of plants, it also requires lavish sunshine and all-year warmth, and is therefore principally a product of the equatorial forest region—more especially of Central America and the West Indies There are scores of varieties of the plant, many of which, like the coconut, have provided natives of the tropics with food, clothing, and even shelter, but the variety that is valuable from the commercial standpoint, though at first produced for export rather unreliably by the natives, is now cultivated on large-scale plantations controlled by powerful corporations The highly scientific technique of marketing adopted by the companies, beginning with the cutting of the banana bunches from the trees, the swift transportation to the coast, then the journey across the ocean in special "cold storage" steamers, enables the fruit to be delivered to far-distant homes in a fresh, ripe condition

Many of the plantations lie along the Caribbean coasts of Honduras and Costa Rica, there are others in Jamaica and Colombia, others producing a different variety of fruit in the Canary Islands, together exporting in normal times thousands of millions of bananas each year to North America and Europe The prosperity of most of these areas is peculiarly dependent on the banana trade, and, as always when a country specialises in the production for export of one type of commodity, they are specially vulnerable to the contraction of their overseas markets on account of war, economic depression, or other causes To a lesser degree, so too are the producers of the pineapple, a fruit which flourishes in a humid tropical or sub-tropical climate, it reaches the consuming areas mainly, however, as a canned fruit In Hawaii its production is almost as important as the sugar industry, the fruit being shipped both to the United States, where markets are also supplied from Florida, and Europe The Azores and the Canary Islands export, too, to the industrial countries of Europe

The date-palm is a product of the tropics, but of that sub-division of the region that we call the hot deserts, and so is the typical tree of that vast arid stretch of North Africa and south-west Asia extending from the Atlantic to the Himalayas It does not grow, of course, in the heart of these sandy wastes, it thrives best in the hot, almost rainless climate in localities where there is a limited supply of ground water—that is, in oases or on lightly irrigated land To the desert dweller, its fruit is far more the staff of life than wheaten bread is to the inhabitants of intermediate lands, for it is often the sole available foodstuff, only at the edge of the desert, where there is sufficient scant vegetation to feed goats, or on the less poverty-stricken pastures, sheep, is he able—usually by leading a nomadic life—to supplement his meagre diet with animal products But in many of the desert lands dates are cultivated for export as well as to feed the native population The richest source of the fruit is the land fringing the lower Tigris and Euphrates, where they were grown in the days of Babylonian glory To-day, the dates from millions of palms lining the banks of the two rivers are shipped from the port of Basra, while dates of finer quality are exported from Algeria, Morocco, and Tunis

Though not a foodstuff, our next example of cultivated vegetation, the tobacco plant, is without doubt one of the few that is consumed in some form almost universally, in every clime by every class of people In the words of Byron,

> "Sublime tobacco! which from east to west
> Cheers the tar's labour or the Turkman's rest"

A native of America, the leaf was found to be used by the Indians for smoking when the first Europeans landed on the continent, and the habit was soon transferred to the Old World The adaptability of the plant to climate and soil has helped to foster the immense popularity of the practice of smoking, for it is now grown from the equatorial forest region to the northern edge of the cool intermediate lands, what it does require is warmth and a moderate amount of moisture, so that in areas experiencing winter frosts it must be cultivated as a summer crop Whilst the plant itself is unusually cosmopolitan, the individual flavour of different species of tobacco is much influenced by the soil and climate in which it is grown and the method of curing, and many types of tobacco have come to be named according to the locality from which they hailed

The chief area of production is still in North America, within those eastern states which lie on the northern side of the humid sub-tropics and the southern side of the intermediate zone—North and South Carolina, Kentucky, Virginia, Tennessee, and Georgia, whence comes that favourite leaf among English cigarette smokers, "Virginia" tobacco, more than one-half of the tobacco that enters world trade is exported from this area As the name indicates, "Turkish" tobaccos for the Oriental types of cigarette are cultivated in the eastern Mediterranean, mainly in Turkey, Greece, and Bulgaria

Along with an immense increase in the popularity of cigarette smoking, there has been a corresponding decline in the consumption of cigars, but many areas still maintain a considerable production of cigar tobacco Cuba is perhaps the most important, her celebrated "Havana" cigars generally being acknowledged as the world's best The Dutch East Indies have taken second place among the exporting nations, on account of the choice cigar tobaccos that are cultivated in northern Sumatra and eastern Java, much of this tobacco is sent, of course, to Holland, where consumption is higher per head of population than anywhere else in Europe Of the total amount of tobacco that is produced for export, most is absorbed by the nations of western Europe—Great Britain, Germany, France, and Holland In many countries tobacco is grown almost exclusively for home consumption, in Europe partly because various governments have monopolised the manufacture and sale of tobacco products India, for instance, is second only to the United States in actual production, but the native-cured leaf is of inferior quality, and practically the entire crop is consumed locally Soviet Russia, too, is a heavy producer, but her contribution to world trade is negligible

Chapter 4

FOOD FROM GRASS

DESPITE the tendency we have already noted for agricultural to replace pastoral farming on some of the grasslands of the world, cereals being usually more profitable than animal products, there are still very extensive areas on which cattle rearing is the main occupation. This is particularly so on the tropical grasslands, or savanna. Among the negro tribes of the Sudan and East Africa, for instance, cattle represent the main item of wealth, and though milk is generally obtained from the animals, only on the rarest occasion are they slaughtered for their meat. Cattle raising is, in fact, a fairly successful means of livelihood on the African savanna—notwithstanding the menace of the dreaded tsetse fly, carrier of sleeping-sickness—and in French West Africa has been encouraged by the manufacture there of meat extracts and animal by-products. From many of the areas—Nigeria, Tanganyika, Madagascar—the export of hides has, naturally, followed upon the native cattle-rearing industry, in others the transition to crop cultivation has already begun.

On the South American tropical grasslands, the llanos of Venezuela and Colombia and the campos of Brazil, cattle raising is again the principal means of obtaining a livelihood, but the animals are of inferior quality, and the industry is of little economic value to the countries concerned. On the extensive ranches of the tropical northern territories of Australia, beef cattle are reared by the thinly scattered white farmers, and are sent to Queensland and Western Australia, most of the meat being consumed within the Commonwealth, there is a relatively small export, however, of beef and hides. Nowhere over the tropical grasslands do the products of pastoral farming contribute noticeably to the world markets If, however, crop cultivation continues to replace cattle raising in the intermediate grasslands, the deficiency in the world supply of meat will no doubt lead to the development of large-scale ranching on the vast available grasslands of such countries as Northern and Southern Rhodesia, Angola, and the Sudan

Of the monsoon countries, where, as we have noted, the natural vegetation over much of the area is grassland, India possesses the highest number of cattle of any country in the world, with water buffaloes estimated at between 160 and 180 millions The animals, most of them of the zebu or hump-backed variety, are primarily employed as draught animals, as in parts of Africa and in most of south-east Asia, and ploughing is generally performed by cattle-drawn implements To the Hindus the cow is a sacred animal which they are forbidden to slaughter, while the Mohammedans consume little of the meat, and the milk is of poor quality and low yield As a result, there is a colossal waste of animal products, and the possession of these enormous numbers of cattle—each individual farmer considers it vitally necessary to own at least a couple of oxen—makes small contribution to raising the abysmally low standard of living of the agricultural population

On the intermediate grasslands of the world, on the other hand, in fact in any part of the intermediate zone where pasture lands are available, the maximum amount of wealth is derived from the cattle-raising industry either as meat or as dairy produce Livestock raising on the grasslands of the U S S R has been much stimulated under the Soviet regime, and in number of cattle the country is second only to India, about half of the animals being of the beef and half of the dairy type The meat is produced for home consumption, but a certain amount of butter has been exported of recent years from the dairy farms of Siberia The only other country owning a comparable number of animals is the United States Beef cattle are raised on the broad, open ranching country of the high western prairies, where the vast spaces over which they are permitted to roam enable them always to find grazing land, even in the drier areas Many of them are sent eastwards to the Corn Belt, are there fattened on the locally grown maize, and, together with cattle raised within the Corn Belt, help to feed the dense industrial centres of the eastern states, much of the beef is supplied to the meat-packing industries of Chicago, Kansas City, Omaha, and other cities Whereas, during the first decade of the century, the U S A was the main source of imported meat for Great Britain, her supplies are now used almost entirely for home consumption, and at times more has to be purchased from abroad

The raising of beef cattle for their meat alone is not an efficient method of providing human food, less so, in fact, than the rearing of dairy cattle Over most of agricultural Europe it forms an integral part of a mixed farming economy, and only in regions where the population is sparse and the land cheap does it become, in general, a successful industry in itself These requisites are applicable in the case of the South American pampas of Argentina, Uruguay, and a narrow strip of south-east Brazil, where ranching was also facilitated by the expanse of available land and the richness of the pastures But even in Argentina the industry now depends very largely on the cultivation of alfalfa, which has replaced much of the natural grassland and occupies an acreage almost equal to that of wheat The cattle are mainly concentrated on the wetter pampas to the east of the "wheat crescent," and there is a high density of livestock as far as the Atlantic coast

Argentina has become the foremost purveyor of beef to the rest of the world, the cattle being dispatched from the grazing areas to the great *frigorificos* or meat-packing factories of Buenos Aires, and the beef then shipped in chilled or frozen condition in cold-storage vessels, chiefly to the countries of western and southern Europe The Buenos Aires meat industry claims to have the largest refrigerating plant in the world, with a daily capacity of 5,000 cattle and 10,000 sheep Some of the meat, however, is exported as canned beef, tongues form a substantial by-product, and the lower-grade beef is generally manufactured into meat extracts In spite of the gradual encroachment of crops over the grazing lands, cattle raising still holds a dominant place, then, in the Argentine economy It is of still greater consequence to the small neighbouring state of Uruguay, where there are actually more cattle to the square mile than in Argentina Fray Bentos and Paysandú, the two small meat-packing towns to which the animals are sent, have become well known by name in the many European countries to which, after shipment at Montevideo, the beef is exported Although Europe has provided the pampas, as well as the grasslands of North America and Australia, with the finest breeds of beef cattle, the continent as a whole is deficient in beef, as in other kinds of meat, and has ready markets for every meat-exporting nation in the world Of the few countries that ever have a surplus of meat, Ireland possesses the greatest number of livestock relative to population, and regularly exports live cattle to England

In the Mediterranean countries of Europe beef cattle are raised to a greater extent than dairy cattle, the resulting scarcity of dairy products, however, is not of major consequence, for, as previously observed, in these lands olive oil largely takes the place of butter Dairying is an industry belonging, essentially, to the northern European nations, in whose normal diet milk, butter, and cheese figure so prominently, though practically all the leading consumers, including Great Britain, France, Germany, Soviet Russia, have approximately equal numbers of beef and dairy cattle It is a relatively small number of countries, Switzerland, Holland, and Denmark, which specialise in dairying, and have become the main exporters of dairy products

The chief problem with the trade in fresh milk consists in ensuring that the product shall be delivered perfectly fresh to the consumer, and sources of production have tended to arise as close as possible to the great urban centres where most of the milk is absorbed In the "hay and dairy region" of the United States, for instance, it is the eastern states, New York and its neighbours, which have concentrated on the production of milk, while those farther west first convert the milk into butter or cheese and then dispatch these products to the east Minnesota, Iowa, and Wisconsin have thus become outstanding producers of butter, while Wisconsin leads in the manufacture of cheese Little fresh milk, then, now takes part in international trade, but considerable quantities are sold as condensed milk preserved by canning, or in the powdered form In Europe the three dairying nations are all exporters, and Great Britain is their best customer The United States exports condensed milk in the main to certain countries such as Cuba and the Philippines which, having a tropical climate, are deficient in the fresh product, though she sells also to Europe

That type of specialisation in one or other of the three dairy products—milk, or butter, or cheese—that was noted among the dairying states of North America is patent, too, in Europe, and Swiss milk, Danish butter, and Dutch cheese have become almost as familiar to English households as Wiltshire bacon and York ham On the northern plateau of Switzerland the moistness of the climate, which is enhanced by the mountainous character of the land, has produced exceptionally rich pastures, and nearly three-quarters of the agricultural land is devoted to cattle rearing Out of these lush Alpine meadows come the Swiss cheese and condensed milk which have acquired such a high reputation among the world's food products The equally celebrated cheese, milk, and butter from Holland are produced in a very different geographical situation the moist, fertile grasslands known as "polders"—land which has been largely reclaimed from the sea and lies below sea level, being enclosed by dikes and equipped with pumping plants so that drainage shall be maintained Perhaps the most remarkable feature about pastoral farming in Denmark is the highly organised system of co-operation among the farmers and the encouragement given to the industry by the state, the unusual degree of efficiency that has been achieved being often contrasted with that of Ireland, a country similarly placed both geographically and economically and relying to a similar extent upon dairy products for her external trade Butter figures even more conspicuously in Danish exports than do dairy products in those of Holland In common with the latter country, her dairy industry is conducted on extremely intensive lines, and cattle feeds have to be imported

Not all the leading producers of butter and cheese are situated near to the main consuming centres, and with the help of refrigeration New Zealand has been able to compete so successfully in the world markets—principally Great Britain,—that her exports of cheese now exceed those of Holland, and in sales of butter she is little behind Denmark and Australia Although situated in the southern hemisphere in the same latitude as the Mediterranean countries in the northern, her climate is much cooler and moister, more akin to the cool intermediate type of north-west Europe, and her dairy pastures lie mainly on the coastal plains of North Island Most of the dairy cattle of Australia which produce the country's important exports of butter are grazed in the wet sub-tropical climate of the extreme south-east Both Dominions have benefited enormously from their close commercial ties with Great Britain, for the latter dominates the markets in dairy products to an overwhelming extent Of the other producers, the United States has the highest world output of butter, but is still only just able to satisfy domestic needs, Soviet Russia, second or third in production, shows a diminishing export of butter as more is diverted to home consumption, Germany, with an output about equal to Russia's, still has to purchase butter and cheese from the main European exporters, and is normally second to Great Britain among the importing nations

On grasslands which are not rich enough for cattle raising, sheep can be grazed, and again the product for which the farmer maintains his flocks may be, generally speaking, one of two—either mutton or wool, though of recent years a number of cross-breeds have been evolved which give satisfactory yields of both Mutton sheep require a damper climate and better pastures than those which are raised for wool production, and flourish in such cool intermediate lands as the British Isles and New Zealand In the latter country only a small proportion of the pastures has been replaced by crops Sheep rearing is the main pastoral industry, and with its small population of less than two million people and vast numbers of sheep—about thirty millions—New Zealand has the highest exports of mutton and lamb in the world

Of the sheep that are grazed principally for their meat the Corriedale breed, obtained by crossing Leicester or Lincoln rams with merino ewes on the Canterbury Plains of South Island, has provided the English consumer with the well-known "Canterbury lamb," as well as producing first-class wool A number of pure English breeds, such as the Romney, the Southdown, the Lincoln, and the Leicester, named after the localities in which they are specially reared, are successful, too, in New Zealand, and, incidentally, afford practical evidence of the similarity in climate between the two countries Almost 90 per cent of the exports from New Zealand consist of the four products mutton (including lamb), wool, butter, and cheese—to such an extent are the occupations of the people dominated by sheep rearing and dairying And in spite of the large numbers of sheep in Great Britain, this country, owing to the density of population and the general taste for mutton and lamb, absorbs the bulk of her exports of frozen meat

On the drier pastures of Australia and the United States, and in the South American countries, Argentina, Uruguay, and Chile, sheep are mainly reared for wool, though a certain amount of mutton does appear in the exports of Australia and Argentina Both in Australia and in the United States the breeding of mutton sheep is tending to expand, in the case of the latter country, however, there is no surplus meat for export, in spite of the fact that mutton occupies a minor place in the diet of the average American, and there is thus a comparatively small home demand

In contrast to cattle and sheep, which are essentially animals belonging to the grasslands of the world, pigs are much less limited by geographical environment and are widely and, it seems, rather irregularly distributed throughout the natural regions Being voracious and at the same time indiscriminate feeders, they can be largely maintained on the waste food products from human consumption, and in areas of fairly dense population Throughout China, for instance, in the tropical monsoon region of the south, in the wet sub-tropical area, and in the cool intermediate lands of the north, immense numbers of pigs are reared, and the national enthusiasm for roast pork has been immortalised in Charles Lamb's famous essay While some breeds appear to flourish in a climate as definitely tropical as that of the Philippines, others are successfully raised in the latitudes of northern Europe On a world map illustrating the distribution of pigs, in fact, the blank spaces do not conform in general to natural regions. but are due to prohibitions imposed by certain of man's religious beliefs Because the animal is, according to the tenets of the Mohammedan faith, unclean and its followers are forbidden to consume the flesh few pigs are to be found in north and central Africa, the countries of the Near East, and India, it may be added that both Hindus and Jews, too, are prohibited by their religious principles from eating pork.

Pig raising is a more significant industry in the United States than in most countries, in part because of the prominence of pork in the national diet The great majority of the animals are reared in the eastern half of the country, being concentrated most of all in the Corn Belt Here they consume a high proportion of the heavy maize crop, and indeed, form the basis of the agricultural system of that area The live animals are largely transported to the great meat-packing centres, such as Chicago and Kansas City, and to other smaller centres dotted about the Corn Belt Enormous quantities of pork are canned, and the importance of the pig to the American economy may be gauged from two salient facts first, the American slaughtering and meat-packing industry as a whole is second in value only to the automobile industry, and, second, of the meats and animal fats exported from the United States most are represented by pig products

Apart from canned pork, the meat of the pig enters trade, in the main, after it has been salted and smoked—that is, in the form of bacon and ham, the one-time "salt pork," on the other hand, has lost all favour, and so has vanished, along with salt beef, from the world markets Formerly the appreciable British requirements of bacon and ham were supplied by the United States, but in recent years have been derived principally from other sources The United States, however, still dominates the trade in lard, the melted fat of the pig, and many of the animals in the Corn Belt are specially fattened for its production, it is in the form of lard, in fact, that quite a large fraction of the maize crop is exported, either to Europe or to Latin America

In northern Europe pigs are fed on the less valuable cereals, such as barley and rye, and also on skimmed milk, and in Denmark and Holland pig rearing is thus closely associated with the dairy industry Denmark has almost twice as many pigs as cattle, and during the years preceding the second World War bacon had gradually superseded butter as her chief export, most of this product being purchased, again, by Great Britain Smaller surpluses of pig products, principally bacon, are normally available from Canada, Ireland, and Holland

Chapter 5

THE HARVEST OF THE SEA

THERE are few major food products that man is still able to gather, in contrast to those which he rears or cultivates, and of these the most valuable are obtained from the sea At first appearance the oceans seem to be the "grey and melancholy waste" which they have been poetically termed, but from the standpoint of their economic value to mankind it would be more correct to describe them, like the continents, as an assemblage of individual regions, ranging from sterile deserts to luxuriant pastures, and possessing a great variety of animal and vegetable life Fish are by far the most important source of human food obtained from the sea, like land animals they are dependent for their existence directly or indirectly upon the vegetable kingdom, and, therefore, they abound where there is a good supply of marine plants The principal food of our edible fish consists of the plankton, those minute and simply constructed plants and animals which swarm in the shallow seas These creatures are devoured directly by the fish of the herring family, and the herring, in addition to being the fish most consumed by man, also provides food for other fish The great fisheries of the world are thus located in the shallow waters bordering the continents, on the so-called continental shelves

Two factors determine the extent to which man avails himself of their wealth—the accessibility of the fish and the availability of other kinds of food With regard to the former, we may note that the Norwegians and the Bretons, living in close proximity to the sea, have for centuries earned a livelihood by gathering its harvest As to the latter, in areas where the climate is so harsh, as generally in the polar and sub-polar zones, or where the population is so dense, as in Japan, that the land does not provide an adequate food supply, the adjacent seas play a vital part in the sustainment of human life

There are four areas in the world where the fisheries are of supreme importance, all of them in the northern hemisphere and mainly situated within the intermediate zone For long one of the most valuable has been that portion of the north-western Atlantic that washes the shores of Newfoundland and Labrador, eastern Canada from Quebec to Nova Scotia, and the New England states of the U S A —particularly Maine and Massachusetts It includes a line of submerged plateaus known as banks, whose shallow waters, fifty fathoms or less in depth, are packed with edible fish The three chief plateaus are the Grand Bank, south-east of Newfoundland, the Western or Sable Island Bank off Nova Scotia, and George's Bank off the Massachusetts coast As a whole, the region comprises the world's principal cod fishing grounds, and is visited by fishermen of many nationalities—Canadian, British, American, French, and Portuguese On the Banks the fishing is free to all, but the rights of "inshore" fishing—that is, in the waters lying within three miles of the coast—are restricted by treaty It is probable that the grounds were fished by the French at the beginning of the sixteenth century, and may indeed have been known to the Norwegians many hundreds of years earlier, it is certain that their discovery was of immense significance to a Roman Catholic Europe where fish was heavily consumed, and that in furnishing the pioneer colonists with readily obtainable food, in the days when agriculture was difficult, the fisheries played a leading part in the development of North America

A high proportion of the yield from the Canadian fisheries is exported, the fresh fish being sent to the United States, and dried and cured cod to the West Indies and South America The Newfoundland fishermen fish almost exclusively for export, the centre of the trade being the capital, St John's, and the main part of their produce consisting of dried and cured cod destined for the Roman Catholic countries of southern Europe, Spain, Portugal, and Italy Their experiences over the last two decades provide still another example of the precarious position of a country whose prosperity is dependent upon her external trade in one type of product Practically the whole working population is engaged in one branch or another of the fishing industry, and when the world depression of the early 'thirties brought a sudden decline in the demand for their produce, widespread and acute distress was the result, culminating in financial collapse The dislocation of the industry on other fishing grounds and the general shortage of food brought an era of temporary prosperity with World War II, but the future for the Newfoundland fisherman is at best uncertain, and at present seems to offer nothing more hopeful than alternating periods of moderate boom and disastrous slump

Besides cod, the most prolific fish on the North Atlantic grounds, haddock, herring, mackerel, and halibut are also caught in considerable quantities Along the coasts south of the St Lawrence River lobsters abound, while crabs are fished especially in Chesapeake Bay, the latter is also the centre of the most valuable oyster-catching industry in the world, in which the two states of Maryland and Virginia take part Menhaden are generally regarded as being unpalatable because of their excessive oiliness, but they are extensively caught off the Atlantic coasts of the United States, their oil being utilised in the manufacture of soap and paints

With her other fishing grounds on the western coasts of North America, the United States owns a rich portion of the world's fisheries These north-east Pacific waters have acquired an added significance through the establishment of a great fish-canning industry, the speciality here being the catching of immense numbers of salmon for export in tins, particularly to Great Britain and Australia On the rivers and creeks of Alaska, on the Fraser and Skeena and other rivers of British Columbia, on the Columbia River of Oregon, and as far south as northern California, myriads of salmon are netted at the canneries as they swim upstream towards the spawning grounds in which they themselves had been hatched Unfortunately, the ease with which the salmon can be caught, owing to this wholesale migration from the sea to their early fresh-water habitat, induced the canners to exercise little or no restraint in their fishing activities In time, this ruthless exploitation, which had proceeded in utter disregard for the reproductive habits of the fish, had the effect of totally clearing the Sacramento River of California and reducing the catch in other rivers by eighty to ninety per cent Individual enterprise in other industries contributed to the destruction the diversion of streams for irrigation and the construction of dams for power plants made more difficult the return of the salmon to their spawning grounds, the blocking of the streams by lumbermen sometimes made it impossible The depletion of the salmon population became so serious that schemes for its conservation had to be applied, or the Pacific rivers would have suffered the fate of so many Atlantic rivers, which, once teeming with salmon, were long ago emptied through unrestricted exploitation, and the numbers were artificially increased by supplying young fish to the streams from hatcheries

Canned salmon represent nearly one-half of the total fish products of Canada, and well over one-half of all the tinned fish produced on the north-east Pacific fishing grounds, large quantities of sardines are also caught and canned, especially in the waters off southern California Deep-sea fishing is pursued, too, in the waters of the continental shelf adjoining these coasts, which are said to be the richest halibut grounds in the world, and also contain cod and herring Again, the practice of continually landing heavy catches has resulted in serious depletion, and there is already grave danger of exhaustion of the halibut fisheries The fisheries of the Great Lakes, which used to swarm with whitefish, trout, lake herring, and other edible fish, are now of relatively minor importance to Canada and the United States Once more the story is one of savage exploitation for the sake of quick and easy profits Hundreds of thousands of tons of this valuable human food, in fact, were landed simply to be used as fertiliser, and many of the species of fish were practically exterminated

On the eastern side of the North Atlantic lie the most extensive of the great fisheries, stretching from the Barents Sea in the north to the shores of Morocco in the south, and including the coastal waters of Iceland Off north-west Europe the continental shelf is extremely wide, covering most of the North Sea and the seas surrounding the British Isles, and part of the Bay of Biscay, and it is this area—in particular the North Sea—which contains the most valuable portion of the fishing grounds The waters of the Dogger Bank, for instance, are extraordinarily rich in plankton, and provide an ample diet for herring and mackerel, while the herring in turn are devoured by cod and haddock Although the inshore fishing rights are, as usual, reserved for the fishermen of the nation that owns the coastline, the open waters of the North Sea are fished by British, Norwegians, Dutch, Germans, and others It was probably the medieval Dutch who contributed most to the commercial development of the fishing industry, and originated the saying that "Amsterdam was built on herring bones" At a later date the fishermen of England captured their supremacy, and for many years the east coast town of Grimsby has been the world's greatest fishing port, and Billingsgate, in London, the largest fish market

On the English fishing grounds herring, mackerel, cod, haddock, and soles are all well represented in the catch, but the Scottish waters provide a very pronounced majority of herrings, with cod and haddock in much smaller numbers. About half of the total supply of British fish consists of herrings, and, although the principal markets for fresh fish are in Great Britain, the trade having appreciably increased of late years owing to the improvement in methods of brine freezing, a considerable proportion is normally exported to the Baltic countries. Some of the catches are brought from waters far distant from the British Isles, but the North Sea is easily the most abundant source of supply, and it is significant that the five leading fishing ports are all situated on the east coast. A large number of British trawlers also frequent the Irish Sea, in the waters off our western coasts hake are widely caught, while the pilchard, the adult version of the sardine, is now much less abundant in Cornish waters than formerly.

The major part of the output of the Norwegian fisheries is destined for export, in value being second only to the products of the country's forests. Cod are fished on the shallow bank around the Lofoten Islands, and are sent in the dried or cured state to southern Europe. The herrings are caught mainly in the waters around Bergen, the principal centre of the fishing industry, and are exported to the Baltic area, while shoals of the smaller fish are canned and sold as brisling.

Other European fisheries of note are those of France, Spain, and Portugal, situated in the case of the first two countries both in their Mediterranean and their Atlantic coastal waters. Off the north-west coast of France, the Breton fishermen share the Cornish pilchard catch, and sardines and anchovies are caught in the Atlantic and the Mediterranean. The oysters of the north-west and south-west coasts of France have become as well known as those of the Kent and Essex coasts of England. Sardines and anchovies are caught and exported, too, by the Spanish and Portuguese, and among the exports of Portugal the value of her canned sardines is not far below that of her port wine, the majority of these tinned fish are purchased by Great Britain. In the Mediterranean another edible fish is the tunny, a large species of the mackerel family which tended as preparation for the production of foodstuffs for the mining industries which are expected to arise in the tundra

In addition to fish, two mammalian denizens of the sea, the whale and the seal, have been of great economic value to man, but again illustrate how unrestricted exploitation leads, eventually, to the extermination of species and the destruction of living wealth The whale was first hunted after it had been found that whale oil, or train oil, obtained from the thick layer of blubber or fat secreted beneath the skin, served as an admirable lamp fuel Norwegian, British, and American whalers vigorously pursued the Greenland whale, which was the main source of the oil, throughout the Arctic Ocean—though American interest in the industry declined following the discovery of petroleum oil in Pennsylvania—and the slaughter was so heavy that before long the northern seas were almost cleared Then the Norwegians and the British turned to the southern hemisphere, were later joined by the Japanese, and proceeded to clear the Antarctic at the rate of over 20,000 whales per year In this area, the Falkland Islands and dependencies are important centres of the industry

As long as whaling had been pursued in small open boats by men equipped with hand harpoons, there was a chance that the animal might survive, but the use of the harpoon gun and explosives and the construction of large floating factories, brought into use to circumvent the restrictions placed on the shore stations, changed the operation to the scale of a massacre After some limitation of the catch was at last agreed upon, in 1937, by most of the whalers, the Japanese, who were non-signatories to the convention, announced that with a new fleet of whaling vessels they intended to quadruple their annual production of 25,000 tons of whale oil At the last International Whaling Conference in 1938, it was announced that over 8,000 more whales had been killed than in the previous year, and whalers were warned that if they did not take steps to conserve resources, they would destroy their own industry No doubt the war has permitted some respite to the whale, as well as to our other marine resources, but complete international agreement on its protection must be achieved if it is not to be doomed to extinction by peacetime enterprise

In the early days train oil was obtained, too, from blubber seals, hunted off the coasts of Labrador, but the herds were soon decimated; nowadays the fur seals, valuable for their skins, are the only species of economic importance, and will be considered in a later section From the bottlenose whale a finer kind of train oil is derived than that of the Greenland whale, while the oil from the sperm whale, or cachalot, yields spermaceti, used in the manufacture of candles, cold cream, and similar products, and ambergris, of value in perfumery, is also obtained from the animal Although oil is the main product from the whale, the Japanese augment their meagre food resources with large quantities of whale meat, but the demand for whalebone, once extensively used in women's corsets, has declined.

Chapter 6

THE CUPS THAT CHEER

BEFORE passing on from our consideration of the produce on which man feeds to the way he clothes himself, we should pay some attention to what he drinks As far as the human race as a whole is concerned, there are three leading beverages, tea, coffee, and cocoa, all of which have achieved great popularity among the dense industrial populations of the intermediate zone whilst being produced in tropical or sub-tropical lands, and all of which, therefore, occupy a prominent place in world commerce

Tea consists of the dried leaves of a small evergreen shrub native to south-east Asia, and was consumed, first, for its medicinal properties But the Chinese recognised the attractiveness of its flavour and its stimulant value, and their poets were singing its praises as a beverage thirteen to fourteen centuries ago It was not until almost a thousand years later that the habit of tea-drinking reached Europe from China, being at first a luxury in which only the extremely wealthy could indulge, and China continued to monopolise the world's tea supply till the middle of the last century

The plant is still principally grown in the monsoon lands of south-east Asia, for it is their type of climate which best fulfils its requirements In the first place, tea will not flourish in areas having a definite cold season, though it is fairly hardy, and if the growing season is sufficiently lengthy, a few severe winter frosts will not cause material damage, but will simply hamper growth and diminish the size of the crop On the other hand, the plant is extremely tolerant of a considerable range of high temperatures—immediately suggesting that the tropics and sub-tropics should be its habitat Further, for the promotion of the healthy, vigorous growth which is essential in order that a continuous supply of fresh leaves shall be maintained, it demands a rainfall that is both abundant and reliable, and a constantly humid atmosphere throughout the summer—the growing season This suggests the wetter parts of the tropical or sub-tropical zone, and particularly those areas which derive an unusually heavy rainfall from the south-west or summer monsoon But the needs of the plant must be narrowed still farther. Although such a glutton for moisture, it suffers quickly from the effect of water standing about its roots, and the soil, therefore, has to be well drained Applying all these desiderata, we should expect tea to be widely cultivated on the hill slopes of an area receiving heavy monsoon rains and comparatively limited in extent, and it is just such areas of north-east India and Ceylon which produce the major part of the world's commercial crop

Of the two main varieties, the Assam plant, which may well be the original, was discovered growing wild in north-east India and was adapted for large-scale cultivation by the British planters It is taller and bears larger leaves than the other, the Chinese variety, if untended, it will grow into a fair-sized tree, but on the plantation it is pruned each spring to the dimensions of a bush, about three to five feet in height Any other type of tree grown in India is a cross between the Assam and the Chinese varieties During the growing season the leaves are picked as soon as they reach the requisite size, within eight to ten days of the first picking a second crop or "flush" is ready and is picked, then after a similar interval a third "flush," and so on till the end of the season, each individual "flush" giving a different quality of tea This plucking of the leaves is an operation calling for a copious supply of cheap, though quite skilful labour, a factor which has prevented tea-planting from becoming a commercial success in many areas which have a suitable climate and geographical situation.

After the leaves have been gathered, they are first withered or dried, and are then mechanically rolled in readiness for the next process, fermentation Assam tea has a rather high content of tannic acid, and the leaves are fermented until this has been reduced by about one-half, leaving sufficient to preserve that strong, sharp flavour which western consumers seem to favour, the fermentation is checked by further drying, and the leaves are then sifted and stems and sub-standard leaves eliminated By far the greater part of the yield of the Indian plantations consists of this stronger product known as "black tea," as distinct from the weaker "green tea" of China and Japan

The tea plantations of Assam are located, in the main, on the hillsides flanking the Brahmaputra river, though they have now extended, too, to the well-drained lands of the valley itself Other important centres in north-east India are the southern slopes of the Khasi Hills in Assam and the Himalayan foothills south of Darjeeling In all of these areas the growing season lasts for about nine months of the year, and only during the winter does the influence of the cool, dry, north-east monsoon stop growth and prevent any further gathering of the leaves Cultivation is successful to altitudes of about 4,000 feet, and at the upper limit, though yields are comparatively small owing to the slow rate of growth, a high grade of leaf is produced More than half of the Indian plantations are situated in the province of Assam alone, but there is another area on the rainy western slopes of the Nilgiri Hills in southern India, where the lower latitude and generally warmer climate permit cultivation to heights almost 200 feet greater than in northern India, and the leaves may be gathered throughout the year

Tea planting came to Ceylon some years later than to northern India, but the industry, encouraged by the failure of the coffee plantations and the release of cheap native labour therefrom, saw a rapid and remarkable expansion, and the island's export trade is second only to that of

India The plantations are clustered in the hill country south of the old capital, Kandy Together, India and Ceylon dominate the tea trade, and exports, whilst being of primary importance to the former, have assumed first place among those of the latter Almost all their surplus tea is purchased by Great Britain—where about half the world total is absorbed—and the other English-speaking countries among whose peoples tea-drinking has become such a widespread habit In the British Isles the annual consumption per head of population is about eight pounds, it is also extremely high in Australia and New Zealand, less so in Canada, while in the United States coffee is generally much preferred to tea The dependence of the Indian tea planters upon the export trade is indicated by the annual consumption of their product in India—about half an ounce per head! By other nations tea is regarded as a peculiarly English drink, and the commanding consumer position of Great Britain and the Dominions brought the centre of the trade to the world-renowned Mincing Lane, London

But it was the Dutch who actually introduced tea to Europe, and they are still relatively heavy consumers Their teas, like the Indian almost exclusively "black," are produced within their own Far Eastern Empire, principally on the higher ground of western Java, while newer plantations in north-east Sumatra have achieved success During this century, expansion has been considerable, and the Dutch East Indies are now not far behind Ceylon both in production and exports

China, Japan, and Formosa produce the more delicately flavoured China tea, which may be either black or green, the preparation of the latter, which is considered unpalatable by the habitual drinkers of black tea, entails no fermentation, so that the processes consist merely of roasting, rolling—very often by hand—and drying The Chinese industry is centred in the Yangtse basin and the hills of the south-east, and is controlled by a host of peasant farmers who cultivate the shrub in small tea gardens on slopes where no other crop can be grown, evolving by old-fashioned methods a product of very mixed quality, although they long ago lost their paramount position in China's export trade, their total output is still the heaviest in the world—but is now mainly for home consumption In general, women and children are employed to pick the leaves, and three crops are harvested during the season—one in early spring, which yields the youngest and therefore the finest leaves, a second in late spring or early summer, and a third, giving an inferior product, in the late summer Some of the Chinese tea is compressed into bricks in order to facilitate overland transportation by human porters or pack animals, and is exported to the U S S R , Russia is traditionally the land of the samovar, but, although after the English-speaking nations she probably has the heaviest consumption among the white races, tea is still largely a luxury product, and the conception of a constantly boiling samovar in every Russian home is just as fictitious as that of an ever-simmering teapot on the hob of every English hearth

On the eastern hillsides of southern Honshu, where the Japanese tea gardens are principally situated, the winters are milder and the monsoon rains heavier than on the western slopes, and again three crops are picked each season The output consists chiefly of green tea, and it is this variety which is normally exported to the United States, where it has a greater popularity than in other non-Oriental countries On Formosa a choice, semi-fermented tea known as oolong is produced

Both in total production and in the amount entering world trade, coffee surpasses tea and cocoa, and from this standpoint may be considered as the most important of the three beverages In one respect the necessary conditions for the growth of the coffee shrub resemble those for the other two plants, for it demands warm summers with plentiful rainfall, but it is more susceptible than the tea bush to cold, and cannot withstand frosts which are either continuous or even of moderate severity. This means that the range of coffee cultivation is more limited than that of tea, and that it is not produced to any considerable extent outside the tropics. Even within that region the major areas of production are restricted, for, being a tropical plant, it is grown where the population is comparatively sparse, and is prepared primarily for export. Yet, once more, it is a product requiring a good deal of cheap labour.

The tree from which most of the coffee of commerce is obtained was very probably a native of the highlands of southern Abyssinia, and its name may be derived from the district of Kaffa in which it was found. From Abyssinia it was transferred across the Red Sea to Arabia, and thence to Europe. A story told among the Arabs is that coffee was "discovered" as a drink by a Mohammedan priest who had trouble in keeping his subordinates awake during prayers. He noticed that his domestic goats always appeared to suffer from nocturnal restlessness after eating coffee berries, so he experimented on the priests, and, at last, succeeded with an infusion made from the roasted and ground seeds. In south-west Arabia the world-famous Mocha coffee is still grown, with the help of irrigation, in the Arab kingdom of Yemen, which has an almost ideal climate for the cultivation. On nearly every day of the year, the morning mists, which form on the low coastal lands, ascend the hillsides, envelop the plantations, and so protect the coffee trees, which are sensitive to extreme heat, from the torrid rays of the sun.

All the areas of heavy coffee production are placed in a similar geographical situation, within the climatic region usually known as the tropical highlands, for the principal commercial tree is essentially a highland as well as a tropical plant, like the original Abyssinian variety. Here, at heights between about 2,000 ft. and 6,000 ft. above sea level, the weather is generally cooler throughout the year than on the tropical lowlands, and so is better suited to the coffee tree, on the other hand, the seasonal range of temperatures is relatively small and rainfall is abundant. But few of the world's coffee planters are so conveniently served with morning mists as those of Yemen, and the young trees are frequently protected from the sun by the cultivation with them of taller, hardier species, such as the banana, or, in Brazil, a type of pea, and are kept pruned to a height of about eight feet. When the berries have ripened, they are picked entirely by hand, an operation involving the employment of a large amount of cheap labour, and the pulpy outer coverings are then stripped off by machinery to release the seeds or beans. Next the beans are cured by exposure to the sun for about a week, and after being hulled, graded, and sorted—according to size as well as quality—they are packed into bags for shipment abroad.

About three-quarters of the world's coffee is grown in South America, normally sixty per cent or more from Brazil alone. That country holds unchallenged sway over the markets, coffee, in fact, is to Brazil what sugar is to Cuba, and her sales represent about two-thirds of the national exports. Most of the plantations, which, in the main, are extremely large, with 100,000 trees or more to each, are concentrated on the rich, deep soil of the state of São Paulo, in the tropical highland belt of the south-east, this area lies on the edge of the tropics and so has distinct seasons, with abundant rains in summer, when it is most needed by the coffee trees, and much drier weather over the harvesting period. Two railway systems carry the crops down to Santos and Rio de Janeiro, the capital, and the main streams of the coffee trade run from these ports to the United States and northern Europe. During World War II the exports to Europe, of course, fell severely, and the total Brazilian output was reduced in five years by practically fifty per cent.

Soil and climate would enable this part of Brazil to provide much more coffee than the world at present requires, but we find, yet again, that the extraordinary bounty of nature has often brought economic distress to the producers and the deliberate destruction of resources While the profits on coffee remained high, the growers continued to establish more and still more plantations, regardless of what the world demand would be several years later, when all these new trees would first bear fruit Consequently, there was immense over-production of coffee, only aggravated by unusually good harvests, prices fell calamitously, and the Brazilian Government had to step in and purchase heavy stocks for retention until prices rose again But, meantime, competition had appeared from other tropical countries, and the demand for Brazilian coffee did not increase, the surplus stocks could not be sold, after all, and the solution decided upon was for millions of bags of coffee to be systematically picked each year, transported from the plantations, and just as systematically burned In three seasons, enough coffee was destroyed to keep the whole world supplied for a year and a half Late in 1943 the incineration policy was at last suspended, after the Brazilian Government had acquired the right to exploit an American patent for converting surplus coffee into plastics—and after more than seventy-seven million bags of coffee had been burned

Despite the varying fortunes of Brazilian coffee growing, and the enforced reduction of the planted acreage, the country continues to dominate the industry, and Colombia, the next leading producer, provides a considerably smaller output This, being mostly of a different variety of coffee, has not been affected by Brazilian over-production From the tropical highlands of Colombia, Venezuela, and Mexico, and the Central American countries of Salvador, Guatemala, and Costa Rica, coffee is exported to the nearby markets of the United States Much of the Central American coffee is specially favoured because it is of finer quality than the Brazilian, one of the highest grades being produced in northern Guatemala, another being the famous Blue Mountain coffee of Jamaica In the Old World, the only major producer is now the Dutch East Indies, third in world output, the plantations being situated on the mountains of eastern Java and western Sumatra Coffee growing has disappeared from Ceylon, where it once flourished, partly owing to indiscriminate planting during the era of prosperity, still more to the ravages of certain diseases to which the coffee tree is peculiarly subject

Since the palmy days of the London coffee houses, in the seventeenth century, tea has retained its place as the Englishman's favourite non-alcoholic drink, and consumption is about three times that of coffee In the United States, whence nearly half the world's exports are sent, and on the European continent, however, the popularity of coffee has continuously grown The Dutch are the heaviest coffee drinkers, importing mainly, of course, from their East Indian possessions, while certain other European nations such as Sweden and Belgium, have a *per capita* consumption about equal to that of the Americans

With regard to world output and its value in the markets, cocoa is the least significant of the three beverages, and the people of Great Britain are exceptional in that they consume on the average, much more cocoa than coffee, with the Americans and the Germans, in fact, they share the distinction of being the world's most confirmed cocoa consumers This is much less on account of their partiality for cocoa in its liquid form than because of the immense growth in popularity of chocolate and chocolate products These confections, in their turn, have only become common luxuries during the last few decades, owing to the rise in standards of living and the availability of cheap sugar When cocoa was introduced into Europe from Central America, before either tea or coffee had appeared, it gained general favour very slowly, despite its nutritive value, and for almost three centuries remained a little-known foodstuff

Like tea and coffee, cocoa is derived from an evergreen plant—in this case the cacao tree, *Theobroma cacao*—the first name of which, we may note, signifies "food of the gods!" Again, it is of tropical origin, its native haunt the equatorial forest region It cannot be grown successfully on the typical coffee lands, for it must not be subject to any marked seasonal fall of temperature or humidity, it requires a hot, moist climate, high temperatures, and abundant rainfall throughout the year, and a deep and well-drained soil Thus cacao plantations are confined to lowland areas well within the tropics, and are best established on land which has been cleared of equatorial forest

The fruit of the cacao tree consists of large pods which hang from the trunk, and have embedded in their pulp rows of small cacao beans, or seeds It does not bear this fruit until several years have elapsed after the planting, and again, being extremely sensitive to insolation, it has to be protected, in its youth at least, by taller trees such as bananas Although the all-the-year growing season of the equatorial climate ensures a constant supply of ripe fruit, one or two main harvesting periods are recognised It is to avoid damage to the comparatively heavy and bulky pods that the planters place their trees in spots which are well sheltered from high winds When the pods have been picked and shelled, the cacao beans have to be put through several processes before appearing on the market, and, as with coffee, the quality of the final product is largely determined by the attention paid to these preliminary operations First comes the fermentation, which is often prolonged for several days, this removes an unpleasant bitter taste from the beans and prevents mustiness from developing later After the fermented beans have been dried in the sun, they are ready for transportation—but further preparation is still necessary at the consuming end They are cleaned and roasted, and then hulled to produce "cocoa-nibs" About half of the cacao by weight consists of a valuable fat known as cacao-butter, or cocoa-butter, most of which is removed by pressure in the manufacture of cocoa before the nibs are finally ground Cocoa-butter has become an important by-product of the industry, and is widely utilised in the preparation of cosmetics For the production of chocolate a certain amount of the fat is retained in the cacao, and sugar is added to the finely ground nibs

Practically the whole output of the world's cacao plantations is destined for export to the white races of Europe and North America, but the constantly hot and steamy atmosphere, which in time drains the health and energy of the white man, has caused most of the labour of production to be left in the hands of the natives Unfortunately, the interest of European nations in the industry led, in certain cases, to exploitation of native labour which recalled the most inhuman excesses of the Congo rubber boom. Probably the worst example came from the Portuguese plantations of St Thomé and Principe, two small islands in the Gulf of Guinea which once were second in world exports Scores of thousands of negroes were recruited in the nearby Portuguese colonies, were shipped over and forced to work in such appalling conditions that the annual death-rate at one time rose to 100 per thousand, only when some European and American manufacturers boycotted Portuguese cocoa were reforms promised But the islands have never recovered their prominence in the cacao trade, and are now comparatively minor producers

There has been, however, a pronounced inter-continental shift in areas of maximum production from tropical South America and the West Indies, for centuries the principal sources of cacao, to the similar equatorial forest region of West Africa, first to the islands in the Gulf of Guinea and later to the neighbouring lowland coastal belt on the mainland Throughout the latter area the plantations are mostly controlled by the natives, and those of the British colony of the Gold Coast have forged ahead in their development of the cacao trade, to leave all competitors well behind and become the suppliers of well over one-third of the world's crop, cacao production is by far the leading industry, and in some recent years the sales have represented about seventy-five per cent of the total value of exports Nigeria, too, has shown a remarkable increase in production, still possesses considerable scope for expansion, and has risen to third place among the exporters While Great Britain imports cacao from the Gold Coast and Nigeria, France draws upon her colony of the Ivory Coast and her mandate, the Cameroons, Spain upon her island of Fernando Po, and Portugal upon St Thomé and Principe Although there is, fairly obviously, a close liaison between trade and the flag, as far as African cacao production is concerned, it is interesting to note that the loss to Germany of her former colonies of Togoland and the Cameroons after World War I caused no reduction in her consumption of cocoa and chocolate

In South America, the main producing area is the low equatorial strip along the coast of the state of Bahia, in Brazil, second only to the Gold Coast in output The western valleys of Ecuador, during the first decade of the century the world's main source of supply, have sunk to a lowly place in the trade, and, while high grades of cacao are still prepared, production has actually declined, partly owing to the appearance of one of those plant diseases to which the cacao tree is vulnerable Brazil and Ecuador send most of their cacao to the United States, the chief importing nation, and, with supplies being also contributed by the major West African producers and others in the West Indies, helped to satisfy the growing American taste for chocolate and to cause a more spectacular rise in consumption of cacao there than anywhere else in the world

Chapter 7

KING COTTON

HAVING provided himself with food and drink, the next most urgent need of man is clothing, firstly, for the strictly utilitarian purpose of protecting himself against the weather, more especially if he happens to live in one of the harsher climates As we have seen, the more advanced nations of Europe and North America make up their diet from foodstuffs and beverages drawn from the four corners of the earth, from regions that are generally as foreign to their daily experience as the valleys of the moon The distinction between their diet and that of more primitive peoples—if we allow for the fact that a high proportion of the human race is lamentably ill-nourished, that famines do still occur—is more a difference of variety than of amount A Wall Street millionaire may choose his meal from the products of five continents and five oceans, and pay dearly for the privilege, but he cannot consume a much greater bulk than, say, the negro labourer on a West African plantation But in the matter of clothing, the well-to-do white man has a princely superiority both in quantity and choice Between two members of the same nationality, for example an Indian mill-owner and an Indian peasant, the distinction in wardrobes is fantastic, and if we were to pursue this study further, we should doubtless be led to the conclusion that the human race is to a greater degree ill-clad than ill-fed Yet there has already been a slight improvement in distribution of clothing—already the generally raised standards of living throughout the world have been exemplified by an increased consumption of those textiles with which man adorns himself This has been most noteworthy in the densely populated areas of tropical and sub-tropical regions such as India and China

Except for a small range of substances, including skins, leather, and rubber, clothing is manufactured entirely from fibres of vegetable or animal origin Incomparably the most important of these fibres are cotton and wool, but of the two there has been a much greater increase in the consumption of the former, and in most years more than three tons of cotton are produced for every ton of wool Cotton more than any other material is responsible for clothing the human race, as well as providing a host of fabrics devoted to other purposes It was known to be cultivated in India centuries before the commencement of the Christian era, and, unlike so many foodstuffs and raw materials that were exchanged between the Old World and the New after the "discovery" of the latter by adventurers from the former, it was most probably growing at that time in almost all the areas where it is now found To-day, cotton is cultivated in a number of tropical and sub-tropical areas, but it is essentially a crop belonging to the humid sub-tropical region, where it is grown in the tropics, as in parts of India and Brazil, the climatic effects of the low latitude are offset by higher altitudes

Raw cotton is obtained from a small shrub, of which the most widely cultivated varieties grow to a height of about four feet, and consists of the white fibres surrounding the seeds inside the fruit or "boll" During the growing season the cotton plant requires a moderate amount of rainfall with plenty of intermediate sunshine, and continuous warmth By the time the bolls have ripened, and are ready to open and expose the fluffy balls of raw cotton, the rainfall should have slackened and a dry sunny period should have ensued for the picking, for the quality of the fibres would be seriously harmed by any excess of moisture Again, the shrub is very sensitive to frosts, and the criterion for successful cultivation is usually reckoned to be a season of 200 frostless days, the planting—the main varieties are grown as annuals—must thus take place after the last severe frost of spring, and the cotton must be gathered before the first severe frost of autumn. All these climatic demands point to the wet sub-tropical region as the most suitable for cotton production Placed in approximately the same latitude as the Mediterranean or dry sub-tropical region, but on the eastern rather than the western flanks of the great land masses, they receive a more abundant rainfall, principally in summer rather than winter, and the climate of that region is sometimes known as the "Cotton Belt" type We find, indeed, that the world's leading area of cotton cultivation occupies the wet sub-tropics, the Cotton Belt, of the south-eastern United States

In addition to the climatic requirements, cotton cultivation calls for the influx at harvesting time of an army of pickers, for when the bolls have burst the fibres must be gathered before they can be damaged by the weather, this has to be done by hand, as no satisfactory machinery has yet been devised—except in the western part of the American Cotton Belt, where the ripening of all the bolls at about the same time facilitates mechanical picking The fibres are separated from the seeds by the ginning process, and are then compressed into bales for dispatch to the manufacturers, oil is expressed from the seeds, and the residue makes a valuable cattle food It was Whitney's invention of the saw-gin in 1793 which gave such a tremendous fillip to cotton planting in the United States, and helped substantially to raise that country to a position of supremacy in cotton production As it reaches the world markets, cotton is classified according to the staple, or length of fibre, the long-stapled types giving the finest yarns and cloths and the short-stapled those of coarse texture Several grades of cotton are recognised by the trade, those of short staple providing most of the world output, but the fibre of highest quality is the Sea Island cotton, so named because it was first cultivated on the small islands off the coast of Georgia, it is still produced there, and in other cotton-growing areas, though only on a relatively small scale

Cotton occupies such a commanding place in the economic life of the south-eastern states that the plant has come to be known there as "King Cotton" Only in the extreme south, the maritime strip along the Gulf of Mexico and most of the state of Florida, is cotton little grown, owing to the heavy autumnal rains In the early days, production was concentrated in the Atlantic states of Georgia and S Carolina, then plantations began to appear to the west, then across the Mississippi, and Texas, finally, became the state of maximum output, the areas of heaviest yield being the "black prairie" soils of Texas, Mississippi, and Alabama, and the bottom lands along the lower Mississippi river Meanwhile, in the east, the soil exhaustion consequent upon long years of cotton-planting forced the planters to employ fertilisers on a large scale, a practice which has since spread In spite of all the advantages of climate, soil, and cheap labour, and the fact that the ordinary short-stapled American cotton is longer in fibre and, therefore, much more in demand than Asiatic cottons, the Cotton Belt has not always been a region of unalloyed prosperity Diseases constantly threaten the crops, the worst menace being the boll-weevil, this insect pest entered Texas from Mexico, overspread most of the area, and in the more humid climate of the Atlantic states, where it thrives, caused a reduction in the cotton acreage from which only in comparatively recent years they have begun to recover There have thus been considerable changes in the districts of heaviest yield, and also in the surplus available for export, in general, however, it may be said that nearly one-half of the world's cotton is grown in the United States and about one-half of this massive output is sold abroad

But the variations in fortune of the Cotton Belt have been due far more to economic disorders than the ravages of nature, and, in a manner analogous to the story of the Brazilian coffee plantations, have displayed the unfortunate results of an unplanned system of one-crop agriculture—unplanned, that is, in so far as there was no co-ordination between supply and demand Prices fluctuated violently, when they were high, the planters extended their cotton acreage, and for fourteen years after the boom following World War I stocks of unsold cotton accumulated By–1932, they had reached the record total of 17 million bales, a normal year's supply But the United States Government, who had bought the surplus cotton from the farmers, recognised, at last, that over-production had gone far enough—in spite of the help they had had from the boll-weevil, which, at this period, attacked and partially destroyed the crops They now paid the farmers to reduce production by ploughing-in some of their land and in two years the amount ploughed-in reached 14 million acres

And what of the social effects of King Cotton's autocracy on the deep south, recounted so romantically in novel, film, and ballad? From the first, slavery was inherent in plantation life, and for over two centuries African negroes and their descendants supplied the cheap labour demanded for cotton-picking When slavery was abolished, it was replaced by the tenancy system, which was aptly summarised by a southern state Governor—"The negro skins the land, and the landlord skins the negro " Most of the crop is grown, especially in the older cotton states, on small farms, and most of these are worked by tenants or "croppers", the former usually own the farm implements and the livestock, and pay a proportion of their crop to the landlord as rent, the latter own nothing, pay half the cost of fertilising and ginning, and receive part of the crop for themselves Below both classes are the wage-hands, who hire out their labour to the farmers Too often poverty drives the farmers to borrow on the security of their growing cotton, too often their reward, poor whites and negroes alike, for producing the raw material for so much of man's clothing is a perpetual load of debt, a timber hut, and living conditions indescribably wretched

A tendency that in time will doubtless profoundly affect social conditions in the Cotton Belt is the increasing establishment of cotton mills there, by reason of the availability of cheap labour and water power and the proximity of the raw material As a result, an ever higher proportion of the cotton that is consumed within the United States remains in the south, and less is being sent to the textile factories of the New England states Of her exports, Great Britain was for long the leading consumer, and there was a close commercial association between the southern cotton plantations and the great textile industry of Lancashire, with Liverpool occupying the place of the world's chief cotton market But since the beginning of the century British manufacturers have been stimulating cotton cultivation within the Empire, in Uganda, Anglo-Egyptian Sudan, and elsewhere, and have reduced their imports of American cotton, so that during the inter-war years Japan, with her rapidly developing textile industry, had superseded Great Britain as America's best customer Much American cotton is also exported to the industrial countries of continental Europe, chiefly to Germany and France

Besides the United States there are only five major cotton producers, among which India leads both in output and exports Her monsoon climate gives far too much rain to many areas for successful cultivation, and production is limited to the less humid regions, cotton being known as a "dry zone" crop, it is, however, India's most important non-food crop One of the three principal areas is the western part of the Deccan, the extensive plateau of peninsular India, which, being sheltered from the heaviest monsoon rains by the Western Ghats, is often quite scantily watered But any lack of moisture is amply compensated by the exceptional quality of the "black cotton soil," so fertile that it is supposed to have yielded crops for thousands of years without manuring, and so retentive of moisture—after rain forming a sticky mud—that irrigation is unnecessary The cotton is in growth during the same season as in the United States, being sown in time for the south-west summer monsoon, but yields are lower, and the female labourers only pick one-half to one-third of the regular output of an efficient male negro Although the quality of the fibre has improved, practically all the cotton is of the short-staple native variety which produces the rougher fabrics, an increasing proportion is being consumed by Indian mills, especially in Bombay, and of the remainder Japan is normally the heaviest purchaser Some longer-stapled American cotton is grown on the alluvial plains of the Upper Indus and Ganges rivers, in the Punjab and the United Provinces, where—rainfall being even lighter—the land is extensively irrigated So much land has been rendered fertile by irrigation that India has been said to add a new Egypt to her area every year, one of the world's greatest projects was the Lloyd (Sukkur) Barrage on the Indus, covering 7½ million acres of soil largely suitable for cotton cultivation, another the Mettur scheme on the Cauvery On the red ferruginous soil of southern India, east of the Cardamom Hills, well irrigated and fertilised, a superior quality of fibre is also cultivated In general, however, American cotton simply degenerates when grown in India, despite the fact that the original American seed was indigenous to India, and there is little doubt that the bulk of the Indian crop will remain of the short-staple type and will not compete seriously with the better American varieties

Egypt, on the other hand, specialises in an exceptionally high quality of cotton This country, although washed on the north by the Mediterranean Sea, does not fall climatically within the Mediterranean or dry sub-tropical region, but is almost completely engulfed within that gigantic expanse of hot desert which stretches across north Africa and south-west Asia Its cultivable soil is confined to the narrow ribbon of land running from south to north through the heart of the country, and extending a few miles on each side of the River Nile, and the low-lying delta of that river land which throughout the country's long history has been made fruitful by diversion of the river waters over the fields, culminating in our day in such magnificent irrigation enterprises as the Aswan Dam More than two thousand years ago Herodotus described Egypt as "the gift of the Nile," and it is equally true to-day that the river is the country's economic artery A comparison of the annual rainfall at the head of the delta, about one inch, with an average of twenty to fifty inches in the United States Cotton Belt and the western Deccan of India, illustrates the complete dependence of the Egyptian cotton-growers on irrigation from the Nile

Most of the Egyptian cotton is the silky, long-stapled Sakellaridis, or Sakel, variety, second in quality only to Sea Island cotton and the finest to be produced anywhere on the large scale It has been sown in Texas and in western India, but with little success, it appears that the plant requires not only a high soil fertility but also the bright sunny days and the gradual increase and decrease in warmth that the long Egyptian summer provides. There is no room for expansion of cotton cultivation in this restricted area, but yields are high from the rich soil—over twice as high as in the United States and five times as high as in India, and no doubt the heavy demand for her excellent-quality fibre from the manufacturers of fine yarns and fabrics in Europe, particularly Great Britain, and the United States, will ensure that for many years cotton remains Egypt's most valuable crop and practically her sole export Cotton has also become the leading commercial crop in the Anglo-Egyptian Sudan, the Egyptian Sakel variety being widely cultivated, though the country is yet only a minor producer, hundreds of thousands of acres have been brought under irrigation by the construction of the great Sennar Dam on the Blue Nile In Uganda, American cotton is chiefly grown, and is again the main crop, and further development may be expected.

With the cotton-lands of China we return to a region which for situation—on the eastern flank of a continent—and climate is comparable with the American Cotton Belt· the main differences being that here the area comes under the influence of the monsoons and thus has distinct wet and dry seasons, and that the cotton is cultivated mainly on the northern edge of the humid sub-tropical zone The chief producing area is the middle and lower valley of the Yangtse River, which serves as the hinterland to Shanghai and supplies its mills with raw cotton, occupying the same position in relation to that city as the western Deccan to Bombay Cotton is also grown to the north, as far as and including the delta of the Hwang-ho river China's total output usually about equals that of Egypt, but only minor quantities ever reach the outside world Practically the whole of her normal production is devoted to domestic needs, much of it being woven into cloth on village hand-looms, or used for padding the winter clothes of the peasants

Soviet Russia, too, concentrates upon supplying the home market, and takes no part in international trade in the raw fibre Cultivation is only possible in the extreme south of the Union, and is largely confined to the Republics of Central Asia, principally Uzbekistan, Ferghana Province being the richest area Most of this region is desert or semi-desert, and, as in Egypt, the plant has to be grown under irrigation In execution of the Soviet plan for increasing the output of textiles and at the same time making the country independent of imported raw cotton, irrigation was extended, and several million acres of fresh land planted To release more land for cotton, grain and other foodstuffs are sent to Turkestan by the Turksib or Turkestan-Siberian Railway, built during the

Soviet regime in accordance with the same general plan Some of the raw cotton, which is of superior American type, is dispatched by rail to Moscow and other textile centres, but a great deal is absorbed, now, by the mills of such ancient towns as Tashkent and Samarkand, which, in their turn, fulfil the needs of the local population in cotton goods In pre-Soviet days these local needs were satisfied by sending all the raw cotton 2,000 miles to Moscow, where it was spun and woven into cloth, the finished articles being returned over the same 2,000 miles to Central Asia!

From the late 'thirties cotton cultivation expanded rapidly in Brazil, the sixth of the world's leading producers, and there is considerable scope for further planting, a parallel development was taking place in the national textile industry, utilising this raw material, and cotton goods became the country's second most important export

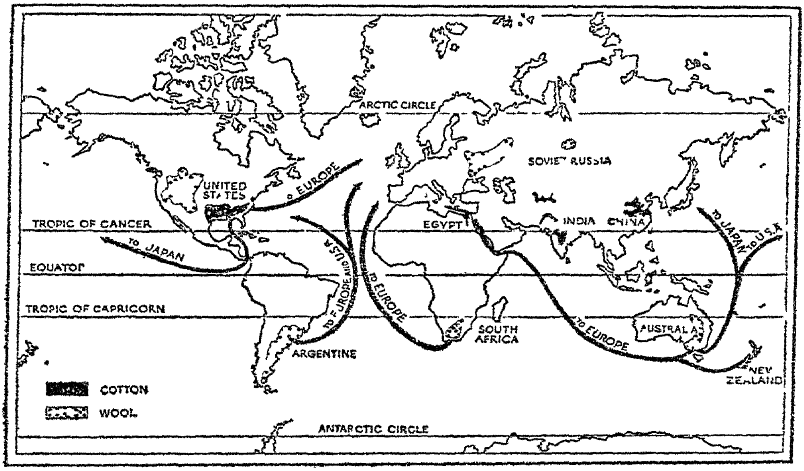
Despite the stimulus given to cotton planting in such new areas during recent years, the United States will almost certainly continue for a long time to dominate both the production and the movements of this extremely valuable item of international commerce, sometimes known as "white gold," and tendencies should not materially alter in the other producing countries

Chapter 8

HOMESPUN TO SILK

NEXT to cotton the substance most widely used for clothing is an animal fibre, wool, which is worn by almost every people living wholly or partly within the intermediate zone, except the Chinese and Japanese To some extent it serves as a coat to most mammals, but it is the sheep, reared from an early stage in man's history and now by far the most numerous of domesticated animals, which provides much the highest proportion of commercial wool A kind of hair, wool differs in very important characteristics both from ordinary hair and from cotton In the first place, the fibres are covered with minute overlapping scales, their edges set in the same direction like the tiles of a roof, this enables them to be beaten or compressed into a fabric known as felt, without the process of weaving Again, the fibres instead of being straight are finely curled, so that a woollen fabric has imprisoned within it a vast number of tiny air cells As air is an unusually poor conductor of heat, it is these small air pockets rather than the actual material which impart such superior warming properties to a woollen garment, while the crinkling of the wool gives it so much greater resilience than clothing manufactured from cotton, linen, or other fibres

Certain species of wild sheep which grow a covering of wool are still extant, but the fleece that is so indispensable to civilised man is overwhelmingly a result of centuries of domestication, the product of the pastoral farmer rather than the hunter We have observed in an earlier chapter that the animals can be raised on relatively poor pastures, and that they are bred to produce either meat or wool Furthermore, we found that sheep of the second category do not demand even such rich pastures as the mutton varieties They thrive, in fact, in a dry, fairly cool climate, which does not subject them to extremes of winter cold, and are thus ideally suited by the intermediate grasslands of the southern hemisphere, on the other hand, the rainfall must not be so light as not to provide adequate fodder, nor must it be heavy enough to give pastures above a certain standard of richness—for then the sheep become peculiarly liable to disease



Where the raw materials for most of the world's clothing are produced the principal cotton and wool regions, with the main channels of international trade

When flocks on the drier grasslands, in time, become impoverished, the stock is strengthened again by importing animals from moister, more luxuriant pastures

Probably the best-known sheep bred specifically for wool is the merino, originally a native of North Africa, which was introduced into Spain in medieval times and gradually improved there, and found the climate and the rather limited pastures so much to its liking that for hundreds of years Spanish wool maintained a high reputation, later the breed spread to other parts of Europe, while the Spanish sheep-rearing industry declined owing to long neglect—though among European producers the country is still second to Great Britain in wool output. Merino sheep were also imported into all the leading wool-producing areas of the southern hemisphere, Australia, New Zealand, South Africa, and South America, and in the first-named country yield a long-stapled fibre of the finest quality obtainable. But against the softness, thickness, and lustre of the fleece, the flesh of this animal is very poor, and in Australia and New Zealand it has been extensively crossed with English breeds to yield better mutton and a modified type of wool. During the Middle Ages wool produced by the native breeds was an important export from England as well as from Spain, and until quite recently small quantities of specially fine, long-stapled type were still shipped abroad. Of these breeds, the Lincolns and Leicesters are two of the most famous, and along with others, have been successfully reared on the grasslands of the southern Dominions, they well illustrate the highly localised nature of the sheep-rearing industry, for while they flourish in the counties after which they are named and in one or two other districts, their fleece quickly deteriorates elsewhere in England.

Nowhere in the world is a region so well adapted to the rearing of wool sheep as the treeless plains of the Murray-Darling basin of Australia a region which almost entirely lies within the intermediate grasslands, and more or less coincides with, but also extends beyond, the Wheat Belt—eastwards over the hill slopes of the Eastern Highlands and westwards into an area where the rainfall is too low for wheat cultivation. Although efforts are being made by the Australian farmers to produce mutton as well as wool, much of the pasture land is too dry for mutton sheep, and sheep-rearing for wool is still the leading agricultural and pastoral industry in the Dominion. Owing to the rather uncertain nature of the rainfall in some areas, flocks have to be watered from the rivers, and in order to avoid the devastation of drought, which in the past has killed enormous numbers of sheep, irrigation schemes for the provision of pastures and fodder crops have been widely applied. To aggravate their problem of maintaining adequate grazing land, the farmers have suffered the depredations of multitudes of rabbits, which, since being introduced into the Commonwealth, multiplied and spread so alarmingly as to become a serious menace, and in some cases forced the abandonment of sheep-runs, much labour and money has had to be expended in keeping them in check. There appears to be little scope, indeed, for the Australian farmer substantially to increase the size of his flocks, and any future development will probably have to take the form of an improvement in the weight of the individual fleece. On the other hand, despite the fluctuations in numbers with rainfall, the Dominion still possesses, and will doubtless continue to possess for some time to come, the most massive flocks of sheep of any nation.

Of this vast number, nearly half are grazed in the state of New South Wales, being particularly concentrated in the famous Riverina district, the wedge of land between the Murray and the Murrumbidgee rivers. In Victoria sheep-farming is mainly located in the basin of the Murray river and in the extreme south-west—the western part of the Great Valley, the latter area, we may note, acts as hinterland to Geelong, an expanding industrial centre where woollen mills have been established. Woollen goods are being manufactured, too, in other Australian towns, but industrialism has not yet proceeded so far as to affect materially the high proportion, between eighty per cent and ninety per cent, of the total wool clip which is exported. Wool is markedly the most prominent commodity in Australian export trade, and the country dominates the wool markets, producing over one-quarter of the world's supply. It may be noted here, with regard to the export trade generally, that the wool is mainly shipped abroad "in the grease" when the fleeces have been shorn from the sheep, usually by machinery, they may be washed to remove dirt, but the high proportion of grease with the fibres is retained during transport, as otherwise they will mat together, the scouring, or extraction of grease by a solvent, which reduces the weight of the wool by about half, is carried out later A noteworthy feature about the Australian trade is, that whereas London used to be practically the only market for her wool, the great bulk is now auctioned before export in Sydney, Melbourne, Geelong, and other home cities and towns, and the part destined for the European continent and the United States is thus shipped direct to the ports of entry Between a third and a half of the Australian wool is purchased by Great Britain, to be consumed by the world-renowned woollen industry of Yorkshire, while France, Belgium, Germany, and Japan are also important customers

Like Australia, New Zealand is pre-eminently a pastoral rather than an agricultural country, and in respect of sheep-rearing shows a similar specialisation in production of wool in some areas, mutton and lamb in others, but her generally heavier, and more reliable, rainfall has evolved a relatively greater concentration on meat, and a more even balance in exports between the two products of the sheep—whilst providing security against drought The vast majority of the flocks are grazed on the less humid hill slopes and plains on the eastern side of both North Island and South Island But the variety in the topography of the islands, besides enhancing their scenic beauty, has enabled a galaxy of the finest breeds of sheep to be successfully raised—the English Leicesters, Lincolns, and others, for instance, yielding their strong, long-stapled, brilliant fleeces So small is the population of the Dominion that nearly all her output of wool, as well as her mutton and lamb, is available for export, frequently giving her, with her considerable imports, the highest *per capita* foreign trade of all nations, and about four-fifths of these exports are absorbed by the mother country.

There are similarities to the Australian sheep-rearing industry, too, in the Union of South Africa, where wool production again is the main agricultural and pastoral occupation. Here the intermediate grasslands are located on the high veldt, a vast treeless tableland 3,000 feet or more above sea level covering the southern Transvaal, the Orange Free State, and the extreme north-eastern portion of Cape Province. Sheep farmers are sprinkled over the whole of this high veldt, while cattle in much smaller numbers are reared in the wetter eastern parts, and the area is the main pastoral section of the Union. As in Australia, the industry has two great hazards to combat—first, the somewhat precarious rainfall periodically causes droughts, which have resulted in heavy losses to both livestock and crops, and, to correspond with Australia's rabbit pest, an equally destructive plague, the locust, has at times descended in swarms upon the pastures, and, in a few hours, consumed every blade of grass over a wide area, so, as in Australia, the numbers of sheep within the Union have considerably fluctuated from year to year. Though generally less esteemed than the Australian wool, the quality of the South African fibre is fairly high, and has been achieved partly by breeding the pure merino strain, partly by crossing this and other breeds imported from England and Australia with the native fat-tailed Cape sheep, which yields good mutton but is useless for its fleece, it is second only to gold among the country's exports, and is shipped to Great Britain and other European countries. During World War II and for one year afterwards Great Britain has been purchasing the entire South African wool surplus.

Wool produced on the intermediate grasslands of Argentina and Uruguay, generally known as River Plate wool, was at one time considered too "dirty" for the British market, and inferior to Australian, New Zealand,

and South African, and was exported principally to the continental consumers—France, Belgium, and Germany But the introduction of the best English strains, and careful inter-breeding, have considerably improved its quality, and it is now sold also to Great Britain and the United States Argentina has a heavier wool production than either New Zealand or South Africa, and, since 1940, has been second, both in output and exports, to Australia

Turning to the northern hemisphere, we find that many countries possess large flocks of sheep, the United States, Soviet Russia, and Great Britain being among the world's leading producers of wool, but that the output of these flocks is in general totally insufficient to supply the huge demands for woollen clothing of the dense industrial populations Both before and for some years after the Revolution the U S S R was forced to purchase large stocks of wool from overseas, in fulfilment of her general plan of economic development, however, the numbers of sheep grazed on the drier pastures to the south of the Wheat Belt were so increased, with a corresponding enlargement of the wool output, that imports have been all but eliminated In the United States, on the other hand, expansion of the sheep-rearing industry is distinctly limited, and imports from the southern hemisphere are considerable Sheep are fairly well distributed over the country, but are most numerous in the dry mountainous ranching country to the west of the Great Plains, in the states of Texas, Wyoming, and Montana, where there is a seasonal migration of the flocks between the arid winter pastures and the loftier summer grazing lands While wool sheep formerly predominated, the quality of the fibre was poor, but again cross-breeding has achieved admirable results, now there is a tendency to breed the animals for mutton, and even, in some areas, for both mutton and wool Much of the home-produced and the imported wool is sent to the mills of the north-east, located particularly in the state of Massachusetts.

Sheep are extensively raised in most European countries, but Great Britain is the only one to occupy a place with the major wool producers of the world, and we should be less than just to omit mention, even in this short study, of the part played in the production of fine wools by the sheep-farmers of the Scottish moors, the Welsh hills, and numerous English counties Largely on account of the abundance of rather poor pastures, the sheep population of Great Britain is, indeed, extraordinarily high, and it is claimed that on the Southern Uplands of Scotland there are more sheep to the acre than anywhere else in the world Yet this country, in common with the other industrial regions of Europe, is heavily deficient in raw wool, and has huge imports from the four main exporters, Australia, Argentina, New Zealand, and South Africa

In addition to sheep's wool, various other animal fibres are woven in minor quantities into different types of textiles Mohair, which is manufactured into strong, bright materials such as plushes, is the product of the Angora goat, a native of the dry steppes of interior Asia Minor, of which Angora, now known as Ankara, is the centre, usually white, the fibre is long, fine, and silky Most of the nomadic peoples of the Turkish plateau win a livelihood from their sparse pastures by rearing Angora and other varieties of goats, and sheep From Turkey the animal was introduced into South Africa, has long flourished on the arid Karroo tableland where the vegetation is too lean even for sheep, and has made the Union the second principal exporter of mohair From the Kashmir goat is obtained the wool into which most of the costly Kashmir (or Cashmere) shawls are woven It is not the main covering of the animal, but the downy winter coat, and each fleece furnishes only about three ounces of fibre—against the six or seven pounds of wool derived from the average Australian sheep The animal is a native of the mountains of Kashmir, the most westerly of the Indian states which are perched on the Himalayan slopes, and of the lofty and thinly inhabited tableland of Tibet, in Kashmir shawl weaving and carpet-making are important native industries Camel hair is manufactured into coarse shawls, blankets, and carpets, usually as a mixture with other yarns, the finer type being produced in northern China and the coarser in Russian Turkestan Two closely related animals, the llama and the alpaca, are natives of the high Andes of South America, and in Peru have been domesticated for the sake of their soft, resilient wool, which is exported from that country and manufactured into alpaca cloth

If we estimate by the amount produced, the fibre next in importance to wool is jute, obtained from the bast or inner bark of a slender tropical plant which grows to a height of about ten or twelve feet It is raised from the seed, which is sown in the early spring, and the crop is cut at the end of the summer Before the jute can be woven into cloth, it has to be subjected to a number of preliminary processes, of which the first is retting, this consists in immersing the stems in standing water for a long period, until they have been so far rotted that the fibres can be readily removed When the latter have been stripped away from the stems, they are washed and dried, sorted and baled They are not so strong or so durable as flax or hemp, and offer little resistance to water, but they have the merit of being the cheapest of all fibres, and on account of its employment as a packing material jute is often called the "brown paper of the wholesale trade" It is one of those important articles of commerce which have become inseparably associated with a certain area, and its large-scale cultivation is practically limited to the humid Ganges delta, in Bengal, where it succeeds best in the alluvial soils lining the river banks, over nine-tenths of the world's jute is produced here

It was first utilised by the peasants of Bengal, who wove the coarse fibre into clothing Then it was recognised by an enterprising Dundee merchant that here was a useful and extremely inexpensive substitute for hemp, and his native city became the first and, for a considerable time, the only jute manufacturing centre in the world. Demand increased side by side with the expansion of the international trade in grains, for the "gunny cloth" into which the jute was converted was manufactured into sacks—and sacks were needed in enormous numbers. With the development of bulk handling of grain in Argentina, Canada, and Australia, this particular type of consumption has been much reduced. But sacks and packing cloths are required for the transportation of other foodstuffs and raw materials, jute yarn, either alone or mixed with other yarns, is employed in the manufacture of carpets, furniture fabrics, and similar household requisites, and the fibre—if jute cloth and sacks be included—is still a leading export from India. Meanwhile, the jute industry has spread from Dundee to other centres in the British Isles and on the European continent and, more significantly, to a group of small towns just north of Calcutta, close to the source of the raw material. This latter area absorbs about one-half of the total output, and jute has assumed for Bengal the economic importance that cotton has for Bombay, the other half of the raw-fibre production is exported more especially to Great Britain, and also to France, Germany, and the United States.

Hemp is the name given to a variety of vegetable fibres. From the bast of the true hemp plant is obtained a fibre which is similar to, but coarser and stronger than, flax. Though fairly tolerant of climatic conditions, it is essentially a denizen of the intermediate zone, and grows most successfully in a habitat suited likewise to flax. We thus find that it is chiefly cultivated side by side with flax in the central area of European Russia and in northern Italy, which have by far the highest world production, preparation of the fibre is also similar to that adopted for flax. Its principal use is in the manufacture of ropes and cords, while the yarn is woven into canvas for sail-making

Manila hemp is rather more difficult to work than true hemp, but produces ropes of exceptional strength and durability, and, like the latter, its finer fibres are also woven in combination with other yarns into furniture and other fabrics A native of the tropics, requiring a heavy and well-distributed rainfall and a constantly humid atmosphere, the plant whose long leaves yield the Manila hemp —a relative of the banana tree—grows wild in the Philippines, and its cultivation is practically confined to these islands, the name being derived from the capital and principal seaport Much of the export trade, which is important to the Philippines, was formerly in the hands of the Japanese Another tropical product, sisal hemp, is extensively used in the manufacture of twine It is derived from the fleshy leaves of a species of agave, whose home is the peninsula of Yucatan, in southern Mexico In this area the plant is widely cultivated, and has the advantage of proximity to the American market, it has also been successfully introduced into a similar environment in Tanganyika, whence sisal hemp has become an important export

Of all fabrics the oldest is probably linen, which is believed to have been used for the wrappings of Egyptian mummies, but has been utterly eclipsed in popularity through the all but universal adoption of cotton goods Yet, when strength and longevity are needed in a fabric, linen is still often chosen It is spun and woven from the fibre of the small flax plant, which is cultivated over a wide range of climatic regions, and in the main for two very distinct purposes, as grown in the tropics and in some other areas, the product of commercial value is the seed, from which linseed oil is expressed, the fibre being too coarse for anything but rope-making, whereas the true fibre flax for linen is an inhabitant of the cool intermediate zone The latter thrives best in firm, damp soils, and is well suited by the flat lands of the North European plain, here, in a belt stretching from northern France to central

European Russia, the greater part of the world's linen flax is produced, with the overwhelming majority of the supply coming from the eastern section of the area, the land sandwiched between the rich black earth of the Ukraine and the coniferous forests in the north

From the farmer's standpoint it is a far from ideal crop to produce, for apart from exhausting the soil to an unusual degree, it demands an immense amount of manual labour during growth, at the harvesting, and in its preparation for the market For this reason its cultivation has been largely given up in the British Isles and the United States, where labour is relatively scarce and expensive When the flax plants are gathered, for instance, they have to be pulled out of the soil by the roots rather than being cut like cereals, then, as the first of a series of preparatory processes, they are rippled, or denuded of their seeds by means of an iron comb Retting is the next operation, usually consisting, as in the production of hemp, in steeping in stagnant water for a few weeks, then the adhering bark is mechanically broken and beaten out, and the long, flexible fibres are finally combed and packed into bales for conveyance to the factory Relative to cotton and wool, the international trade in flax is small, and most of the heavy output from White Russia and the neighbouring area is covered by home consumption, the supremacy of the U S S R in flax cultivation has been further enhanced by her acquisition of the three Baltic states of Esthonia, Latvia, and Lithuania, all of which normally export flax Some flax is still grown in north-eastern Ireland, and Irish linen has long enjoyed a high reputation among British consumers, raw flax is imported into Great Britain from Belgium and the Baltic states

Our linseed imports, however, represent a much higher value, and are principally purchased from Argentina and India More of the world's flax is now grown for the seeds, indeed, than for the fibre, for the linseed oil which is expressed from them has the invaluable property of drying on exposure to the atmosphere, and so is used in the manufacture of paints and varnishes, while the residual cake makes an excellent cattle feed, linoleum is another commodity of which linseed oil is a constituent Much linseed flax is cultivated in Soviet Russia and in the United States, where the labour difficulties of fibre-flax production are absent, but Argentina and India are the only countries having an appreciable surplus for export, the former, in fact, dominates the international trade Flax is grown extensively in the wheat and maize belts of the pampas, almost all the linseed produced is shipped overseas to the United States and northern Europe, and in recent years its value among the country's exports has sometimes been second only to wheat

ARISTOCRATS OF APPAREL

In the course of man's long struggle to exploit the world's wealth, he has made use of very few domesticated insects, but one of these unusual species has been for many centuries the source of the aristocrat of textiles, silk. This most beautiful, most costly fabric, the wearing of which still, to a large degree, symbolises wealth and privilege, is in fact the product of the caterpillar, known as the "silkworm," of a type of moth A number of kinds of wild moth are also utilised, the cloths being given the general name of Tussore silks, but the silkworm is the raw material of a highly specialised industry It feeds upon the leaves of the white mulberry, and sericulture is therefore confined to areas in which the tree yields these leaves in sufficient profusion to permit large-scale breeding—mainly the humid sub-tropical region, with its warm summer and its short, mild winter As an illustration of the immense number of mulberries required, one ton of leaves is consumed by the silkworms from about one and a half ounces of eggs and is the crop of about three dozen trees After the eggs have been incubated, the tiny caterpillars are fed on leaves stripped from the mulberries, usually under cover to protect them from the weather For several weeks they greedily devour the leaves, meantime shedding their skins four times, and then, as they approach the chrysalis stage, each one emits two slender filaments of viscous material which unite and harden on exposure to the air At the commencement of this part of the metamorphosis, before the caterpillar has begun to spin itself a cocoon from the thread so formed, every single silkworm has to be picked out and carefully placed in position! During the short life of the caterpillars, the weather is of paramount importance, not only in order that they shall have a continuous supply of fresh mulberry leaves, but to ensure their productivity, and the temperature should not fall at any time below about 60° Fahrenheit

From the cocoons the finest specimens are selected for breeding, while the remainder are killed by heat Each one yields on an average about 400 or 500 yards of silk thread, which, however, is too fine in single thickness, the filaments are adhesive enough to unite, and in the "reeling" process several of them are joined—half a dozen or so for fine threads, up to twenty or more for coarse threads In most areas the silk is nowadays reeled mechanically in small factories called filatures, but in the peasant homes of interior China even this laborious operation is still performed by hand As the cocoons give less than one-tenth of their weight of raw silk, the thread is almost always reeled and collected into hanks before being exported

Our brief survey of the production of raw silk is sufficient to indicate that an adequate labour supply is as vital as the correct type of climate Not only must the workers be willing to accept abysmally low wages for long hours, so as to bring the final product of their labour within the means of at least the world's wealthy minority, they must also exercise exceptional patience and skill throughout all the tedious processes· qualities which have been handed down through scores of generations of Chinese and Japanese families. But in the south-eastern

United States, with a wet sub-tropical climate remarkably similar to that of the centres of heaviest production in China and Japan, sericulture is absent—although that country with her high standard of living is the foremost consumer of raw silk in the world There, as in many other areas, the available labour has never been cheap enough

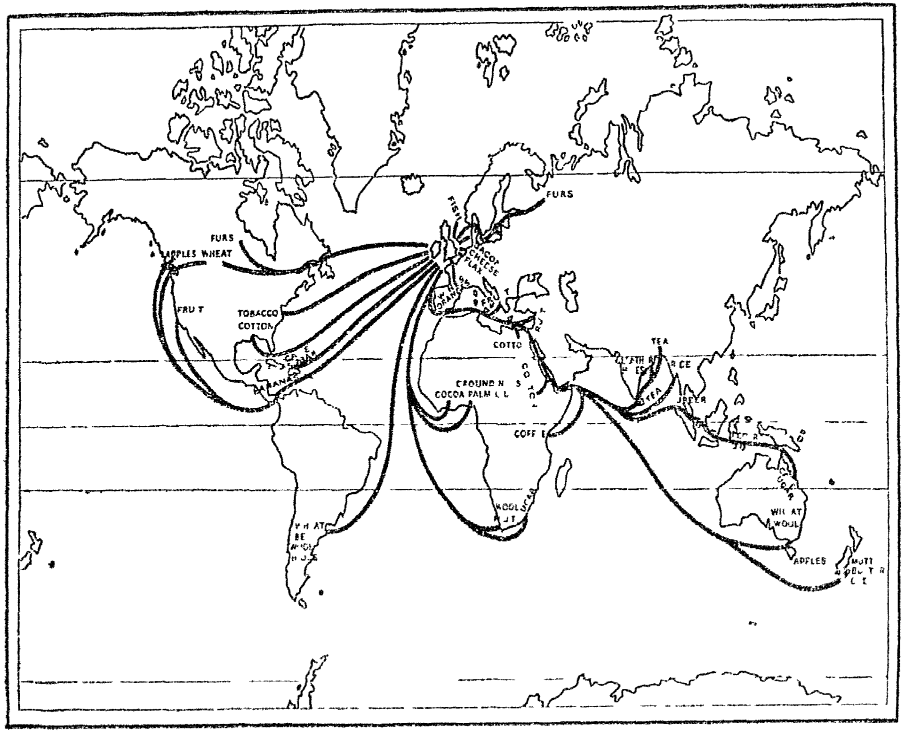
Both in China and Japan the raising of silkworms is usually carried on along with other agricultural activities, the mulberry trees growing side by side with food crops such as wheat Most of the intricate labour is thus left to the women and children, and this great multitude of family workers in the two countries together practically monopolises the production of silk China was most probably the original home of silk, and the enterprising lady who is supposed to have discovered the fabric well over four thousand years ago, by name Si-ling-she, was afterwards raised by her grateful compatriots to the dignity of a saint Production is heaviest in the thickly populated basin of the Yangtse River and Shantung, whence much of the raw silk is sent to Shanghai, and in the south the Si Kiang delta, which supplies the mills of Canton Raw silk was for long dominant among China's exports, but although she still probably leads the world in output, her overseas trade of recent years has steadily declined

Japan's total production is smaller and at the same time more variable, on account of the more northerly and thus more inclement climate, but the country has easily captured the principal world markets, sericulture is mainly conducted in the mountainous areas of the main island of Honshu, where good arable land is scarce Before the commencement of the second World War, practically the whole of Japan's raw silk surplus was absorbed by the United States, still more being imported from China and a few minor producers Even in Japan, however, the output of raw silk has already been surpassed by that of artificial silk This substitution of the artificial for the natural fabric is world-wide and will undoubtedly continue, for the greater cheapness of the former makes it available to a much wider range of incomes Outside the Far East, silk is produced on the Plains of Lombardy in northern Italy, and is supplied to the old silk city of Lyons in France, as well as to the mills of Milan, some expansion of production has also taken place during the past decade in Soviet Russia

As sartorial emblems of nobility or authority, silk and ermine are often coupled together, and among the peoples of the intermediate zone, at least, furs are widely regarded as luxury clothing In the colder parts of the earth, on the other hand, they form an essential protection against the harsh climate With regard to international trade, they represent by far the most valuable commodities which man in his primitive occupational rôle of hunter supplies to the world In general, they are one of the two principal products of a region we have not yet considered—a wide belt of sub-polar climate, lying between the intermediate zone and the inhospitable tundra, and largely clothed with coniferous forests, stretching across the northern territories of North America and northern Eurasia Within these coniferous forests there still exists a wealth of fur-bearing animals of varied size and worth, including the stoat or ermine, squirrel, fox, musk-rat, sable, and beaver In the more temperate areas where agriculture is possible, it would often be insufficient to support human life, and hunting and trapping therefore considerably help the inhabitants to maintain a reasonable standard of living, the more northerly man's advance into the forests, the more do they become his principal occupation At the same time it is the poleward side of the area, with its longer and more severe winter, which produces the finest furs

Throughout the region the trapper has played the part of explorer and pioneer, usually in advance even of the lumberman in the New World he contributed greatly to the establishment of British authority in North America, in

To feed and clothe the industrial population of Great Britain, a rich variety of imports has to be purchased, the sources of some of the main items are shown here



Eurasia he was equally instrumental in securing the Russian settlement of northern Siberia, the high value of his merchandise helped to compensate him for its difficult and frequently expensive transport to the collecting centres So much of Soviet Russia's vast territory lies within the sub-polar region and is covered with coniferous forests that for long the country has led the world in production of raw furs, and, whilst her generally harsh climate creates an enormous home demand, they also form one of her main exports—the most important pelts being those from the animals already mentioned, with the exception of the North American musk-rat Most of the Russian skins are sent first to the city of Gorky (the old Nizhni-Novgorod), but on the European continent the principal centres of the fur trade are Leipzig, situated in an excellent position with relation to both the source of the furs and the extensive consuming area of central and eastern Europe, and Leningrad London, however, has the world's largest market, now operating again after its temporary eclipse during the war, and receives furs from all the main producing areas

Canadian skins, coming from northern Ontario, Saskatchewan, and Alberta, are auctioned either in London or New York, the Americans being the principal buyers in the international trade Tens of thousands of American Indians still roam the lonely, pathless forests of north-west Canada, trapping the fur-bearing animals, earning a livelihood by exchanging them at the trading-posts for foodstuffs and everyday commodities But, whereas the Indians and Eskimos had habitually conserved their animal resources, the advent of the white man with his perpetual search for quick profits brought extermination to the forests, and together with the removal of the natural home of the animals—caused by the same ruthless exploitation on the part of the lumber industry—led to a serious depletion in the reserves of living wealth Present-day control of trapping has partially repaired the destruction, but over large areas of the northern United States, and to a lesser degree in Canada, such precious species as the beaver had vanished well over a quarter-century ago, and there have already been signs more recently of a growing scarcity of much commoner animals like the musk-rat A similar tale can be told of the fur-seals, which provide the world of feminine fashion with its much-prized sealskin coats American, British, Japanese, and Russian sealing-ships so relentlessly hunted down these animals that they were soon all but cleared from the Antarctic, and were rapidly dying out in the Arctic seas At last the United States succeeded in imposing some control over the slaughter of the seals, which had become practically confined to the small American Pribilof Islands off the Alaskan coast, where the animals breed, and by careful limitation of the activities of the sealers have materially increased the size of the herd

A modern development which will assist in preserving some species is the practice of fur-farming, the raising of the animals for their skins in captivity, which has been successfully applied to the fox, musk-rat, beaver, mink, and raccoon In Canada, where there are now nearly 8,000 fur farms, and in Soviet Russia the industry has assumed major importance, and has been specially adopted for the production of silver fox furs Of the more plebeian branch of the fur trade we may note the vast export from Australia of rabbit-skins, which nowadays are cunningly processed to resemble various kinds of more valuable pelts.

Chapter 9

WEALTH FROM TREES

TREES are not always commercially valuable either for their fruit or for their timber. A number of tropical varieties, for instance, have been exploited for the juice, or latex, secreted beneath their bark, which, when coagulated, becomes rubber. Nowadays, practically all the rubber produced commercially is derived from a tree known as *Hevea brasiliensis*—as its name suggests, a native of the equatorial forests of the Amazon river in Brazil—which has become pre-eminent because of the high quality and quantity of its yields of latex. In its natural habitat—the hot, steamy, dense, often almost impenetrable, jungle of tall trees and climbers—*Hevea brasiliensis* is well dispersed among many other species, a factor that rendered the collection of "wild rubber" a far from easy task. During the early days of the industry, supplies consisted exclusively of this wild or Pará rubber—so named after the place of export—and the same "robber economy" that we have noted with respect to other natural resources was practised. In their work of quickly producing the maximum possible amount of latex, the native collectors felled, and thus killed, the rubber trees indiscriminately; they pressed ever more deeply into the jungle, leaving behind them a trail of devastation, facing ahead a store of wealth that was becoming ever more inaccessible and difficult to exploit. In the equatorial forests of the Congo Basin, in Central Africa, where wild rubber was collected from a number of trees and creepers, the procedure was repeated. After a period of phenomenal expansion, when lavish fortunes were made, production declined rapidly, by the beginning of the first World War had already been surpassed by the output of plantation rubber, and now has a negligible influence in international trade

As long as the principal use for caoutchouc, or india-rubber as it was first called, was the erasing of pencil marks, the collection of wild rubber might have proved adequate But when the demand rose so enormously after Mackintosh's invention of his waterproof fabric, and later still more with Goodyear's invention of the vulcanisation process for hardening rubber, this primitive method of production became utterly insufficient Man, having begun to move about the world on rubber tyres, was impelled to find an alternative, ampler source of the raw material seeds of *Hevea brasiliensis* were taken from Brazil and transplanted in an area of similar climatic conditions—the equatorial forest region of south-east Asia Here, after initial hesitancy, doubts, and failures, the uniformly hot, rainy, and humid climate was found to be ideally suited to the tree, and efficient, well-organised plantations were established, first in Malaya and Ceylon and later in the Dutch East Indies Now a rich and steady supply of latex was available, for by careful tapping each tree could be made to yield for several years

To obtain the latex, diagonal slits are cut in the bark, great care being taken not to cause injury to the tree, and the milky juice which runs out is collected in small cups, fresh tappings are made about every other day, and often the trees are given a resting period at some time during the year The latex is coagulated by the addition of a weak acid, the water is removed by pressure, and, after drying, the thin sheets of rubber which remain are ready for export On the plantations the work of constantly tapping the trees and keeping the soil free from weeds requires a good supply of cheap labour, this has been furnished in Malaya by scores of thousands of imported Tamils from southern India, and Javanese, who, being more industrious than the natives, make much more desirable coolies This alien population varies remarkably with the market price of rubber, the stream of immigrants reaching its maximum volume during a boom, to be followed by a corresponding outflow at the next slump. Alongside the British planters and their host of indentured Tamils and Javanese are numbers of immigrants from southern China, who have also established plantations. Like the native rubber-growers of Java and Sumatra, they have few expenses and no labour problem—for the work on the plantation is performed by the family and a few friends and relatives. They are thus comparatively little affected by the vagaries of the rubber market, when prices are high, they can produce to their highest capacity, when prices fall, they can cease production without suffering catastrophic losses. Consequently, of late years, they have won an important place for themselves in rubber production, despite the fact that "native rubber" is of inferior quality and is produced by haphazard and inefficient methods.

Among European and native planters alike, over-production of rubber has sometimes caused fantastic repercussions. During the early boom prior to World War I they all extended their plantations to the utmost, but by the time all the new trees had matured and were being tapped, about seven years later, world consumption was lagging well behind the increased output, and the price of rubber fell to little more than five per cent of its former value. Intervention by the British Government caused the planters in Malaya, Ceylon, and India to restrict production until the price could be stabilised, but the Dutch refused to co-operate, and, along with their native growers, continued to extend their plantations. After another period of very transient prosperity, the inevitable slump followed, and the price of rubber collapsed to about one per cent of its boom level, but not until 1934 could the British and Dutch agree over restriction, reducing the dangerous native competition with an export tax, and forcing up the price once more. Opposition to the control of production and price was most vehement from the United States, who, with her huge automobile industry, consumes about half the world's natural rubber for the manufacture of tyres

Until 1941, when the Dutch East Indies took first place, Malaya held the lead in production ever since plantation rubber superseded wild rubber in the world markets, and the commodity is easily the chief export from this normally prosperous area Although rubber occupies a less predominant place in the external trade of the Dutch East Indies, being mainly produced on Java and Sumatra, this group of islands is the only source with an output of similar dimensions Ceylon, British North Borneo and Sarawak, French Indo-China, and Siam are the principal minor producers, all situated, it will be noted, in south-east Asia Apart from the tremendous shipments of rubber from this region to North America, considerable amounts are also consumed by the automobile industries of Great Britain, France, Soviet Russia, and—formerly—Germany and Japan Attempts on the part of the U S A to render the country less dependent on foreign rubber have been seen in the use of regenerated rubber and the extension of American-owned plantations in Brazil, while under the stress of war needs the production of synthetic rubber has progressed by leaps and bounds in 1945, in fact, it was announced that some American plants were producing synthetic rubber at a lower cost than the pre-war price of natural rubber It seems likely, however, that, at least for many years to come, the high-quality Asiatic product will continue to be in demand

Considerable numbers of different trees are exploited purely for their timber, which is generally divided into two categories known as the "hardwoods" and the "softwoods," the former being obtained from broad-leaved trees, subdivided again into those from the tropical and those from the intermediate zone, and the latter from the coniferous trees of the sub-polar or cold intermediate region Even if we exclude the vast amount of softwood that is transformed into wood pulp, the remainder still represents about four-fifths of the world's timber consumption, and of the fraction contributed by the hardwoods, only one-tenth comes from the tropics An enormous reserve of practically untouched hardwood timber exists in the evergreen equatorial forests of Central America, the Amazon basin, Central Africa, and south-east Asia, but several factors have militated against its exploitation In the first place, the trees almost always occur in mixed stands, so that one particular type can only be procured with extreme difficulty Then the dense undergrowth, frequently accompanied by a swampy soil, the unhealthy climate, and in general the great distance from the consuming centres—with so bulky a product an important point—all contribute to making the working and transportation of most of the tropical hardwoods an impracticable proposition Only the species which are exceptionally distinguished for their colour, hardness, or other qualities, such as the cabinet woods, can be economically exploited

Where a high strength and durability for structural purposes are required, teak is much in demand, for in these qualities it is comparable with oak, and has the added advantage of impeding rather than promoting rust in ironwork The tree is best suited by a climate having a pronounced dry season, and so is most abundant in the moderately rainy, deciduous monsoon forests of south-east Asia Much of our commercial teak is felled on the slopes of the Arakan Yomas and the Pegu Yomas of Burma Being heavier than water when in growth, the trees are first killed by the excision of sections of bark, and are then floated down the tributaries of the Irrawaddy, and along the main river to the sawmills of Rangoon, whence they are exported, more teak is cut down from the forested hills along the Siamese border, and is floated down the Salween, total output normally represents one of Burma's three main exports Teak floated down the River Menam to Bangkok is also one of the principal exports from Siam

For fine cabinet work the hard, beautifully grained, richly coloured mahogany, which age improves rather than impairs, has few equals A native of tropical America and the West Indies, it is obtained largely from Mexico and British Honduras Of a number of other varieties which resemble the true mahogany in colour and texture, and have been loosely designated by the same name, the African mahogany, found in the forests of West Africa, is exported from the Ivory Coast Ebony—hard, finely grained and usually pitch-black—has its home in the forests of tropical Africa and south-east Asia, again, in the timber trade the name has been applied to several trees, of which the finest and most valuable is found in India Various tropical cedars, also so named because they are supposed to have the same colour or general appearance as the far-famed cedars of Lebanon, have been much used on account of their fragrance in the manufacture of cigar boxes, most of the tropical cedar-wood now consumed is imported from Central America

In contrast to the immense stands of tropical hardwood timber still untouched, the hardwood forests which once clothed so large a portion of the intermediate zone have been all but cut down in the advance of lumberman and farmer Deforestation has been so extreme in many areas that soil erosion and flooding of the land have followed Over much of northern China, over the whole of Europe with the exception of Scandinavia, Finland, and northern Russia, over the United States east of the Mississippi, no more than scattered remnants of the original forests are left, land once covered with trees now lies under crops and pastures, while in the more highly industrialised regions these latter have again been largely replaced by agglomerations of factories and furnaces, workshops and workers' dwellings Many European countries have applied strict conservation measures in order that their small remaining resources shall be preserved Of the hardwood trees exploited in this region, the oak, extensively employed in the manufacture of furniture, is the most important, it grows chiefly in the cool intermediate zone of north-west Europe and eastern North America, and is exported from Canada, the United States, and central Europe Walnut, maple, elm, and beech are other leading hardwoods

Although Australia is by no means richly endowed with forests, the hardwood timber from her eucalyptus trees has gained a high reputation in Great Britain and other parts of the Empire Two of the most valuable trees, the jarrah and the karri, cover several million acres of the extreme south-western section of Western Australia, an area enjoying a Mediterranean type of climate and a moderate rainfall, and are largely exported for the manufacture of such articles as wood paving-blocks, railway sleepers, and furniture Of the wide variety of vegetable substances employed in tanning, the bark of the Australian black wattle is important on account of its high content of tannic acid, though the main source is now the plantations which were established in Natal, an extract prepared from the quebracho, a tree native to the forests of northern Argentina, is, however, in more general use

SUB-POLAR BELT

On the poleward side of the deciduous forests of the cool intermediate zone, in the northern hemisphere, is the cold intermediate or sub-polar region an immense belt of land, extending across northern North America and northern Eurasia, which contains almost all the world's great coniferous forests Along the southern edge of this belt, the conifers are mixed with deciduous trees, farther south, the latter increasingly predominate, and one type of forest gradually merges into the other as the climate becomes milder—except at the higher altitudes, where the conifers remain in the majority Along the northern edge the trees become smaller and more scattered, until, approaching the tundra, only a few undersized individuals placed in sheltered spots are able to exist It is fairly obvious, then, that from the commercial standpoint, and considering, too, the problem of transport, the southern portion of the forests has the greater value

Within the region, rainfall is comparatively slight, and except in the south or in milder maritime districts most of the precipitation falls as snow, but temperatures generally are so low that evaporation is also slight, and the moisture is sufficient to maintain a rich forest growth Moreover, the long winters, the extremely short summer growing-seasons, and poor soils have repelled agricultural encroachment, and—apart from the inroads of the lumber industry—over most of the area there has been much less depletion of resources than in the hardwood forests On the other hand, the region as a whole is far from uniformly covered with first-class softwood timber In many areas the low rate of evaporation has combined with poor drainage to produce extensive swamps and bogs, where trees are either absent or badly stunted, on this account a high proportion of the vast forest land of Soviet Russia—particularly Siberia—and, on a much smaller scale, of northern Canada and northern Sweden, is considered to be worthless

A comparatively small number of conifers provide the majority of our softwood resources, and one considerable advantage to the industry is that the three main species, the pine, the spruce, and the fir, are very largely found in pure stands All the ordinary timber for the building trade, and for the manufacture of pit props, boxwood, and cheap furniture, is obtained from them, nowadays another most important use is the preparation of wood pulp, preliminary stage in the manufacture of over ninety per cent of the world's paper, which demands a massive and continuous supply In general, the wood is transported in the form of logs, planks, and boards, though an increasing amount is now reaching the consuming centres as finished or semi-finished products, such as doors, window-frames, plywood By reason of the enormous bulk of the raw material, large-scale exploitation of the forests for export, as with other kinds of timber, is only an economic proposition when water transport is available throughout most of the journey

So much of the forest resources of Canada and the United States has been depleted that the two countries are frequently said to be "mining" their timber—exploiting it, as they would minerals, without replenishment, and their once tremendous resources are still being expended at a high rate This was partly due to the felling of trees to make way for agriculture, partly to the destructive methods of the lumberman in cutting without replanting In contrast to the very gradual disappearance of the European hardwoods, this plundering of the North American forests has taken place within comparatively recent times It is estimated, in fact, that only one-third to one-quarter of the original stands of conifers in the two countries now remains

Devastation has been particularly intense in the United States, where, in three of the four main regions, the land under forests has been reduced to a small fraction of its initial area, where large timber has been all but exhausted, and where cut still exceeds growth Within three decades the lumber industry swept through three Great Lakes states with something of the ruthless vigour of one of the forest fires that so often completed its ravages Michigan, at one time the leading lumber state, was quickly denuded of its timber, and now imports, Wisconsin suffered a similar fate, and Minnesota is now following suit Depletion has also taken place in the forests of the Gulf states, home of the celebrated pitch-pine, while in New England the sawmills are now forced to draw their supplies largely from Canada Not all of these vanished and still vanishing resources, of course, consisted of softwood timber In the extreme north they did, being a continuation of the coniferous forest belt of Canada, farther south they mingled with stands of deciduous trees, and the eastern and south-eastern states were clothed very largely with hardwoods A high proportion of the national output of both softwoods and hardwoods still comes from the south, while pine tar, obtained particularly in Florida from the southern pines, turpentine, and resin are valuable by-products But here, too, the results of uncontrolled deforestation are now being felt; little of the virgin growth remains, and there is small doubt that the lumber industry will soon have to draw wholly upon the country's fourth and final store of timber, in the north-west

Separated from the eastern forests by the broad agricultural grasslands, these forests of the north-western states are composed almost entirely of conifers As we have previously observed, altitude has a very similar effect on climate to latitude, and a tongue of the coniferous forests thus projects southwards from the Canadian border over the slopes of the Rocky Mountains, the Cascades and the Sierra Nevada, and the coastal ranges of Washington and Oregon. Within this western mountainous region of the United States, and principally in the states bordering the Pacific coast, now lie the only ample reserves of softwood timber; in some individual areas the same reckless exploitation was practised as in the eastern forests, and fires have accounted for other stocks, but on the whole the woodland has not markedly shrunk from its original limits Much of the timber in the north-west is too large to be water-borne to the coast, and the rivers are too swift in flow and too lavishly studded with rapids and falls, so that transportation is largely by rail While spruce and fir occur at the higher altitudes, the famous Douglas fir from the Pacific slopes of the Cascades, and, farther inland, this tree and the yellow pine, provide the major part of the timber for the important lumber trade which has arisen round Puget Sound, they are, indeed, the principal species for the whole area, and together form over forty per cent of the country's total saw-timber stands Farther south the timber becomes smaller and in the main is consumed locally, and southwards again, on the lower hillsides at least, the conifers merge into the typical mixed forests of the Mediterranean region of California

From the standpoint of the amount of labour employed, lumber and lumber-working comprises one of the foremost industries in the United States, and in addition to the gigantic domestic consumption a considerable though diminishing quantity of timber is still exported American *per capita* consumption of wood pulp is the highest in the world, most of it being manufactured from spruce, and as the home supplies of this softwood gradually dwindle, the pulp and newsprint imported from Canada assume increasing importance, over and above her own massive production of wood pulp, the country absorbs about four-fifths of the Canadian output Unless scientifically planned schemes of afforestation are widely adopted, the exploitation of the last virgin stands in the north-western states will before long compel the United States to rely altogether upon external sources for every type of softwood timber

In Canada, exploitation of the forests has been rather less destructive than in the United States, but it is estimated that well over one-half of the original stands have succumbed to fire, while little more than one-quarter of the present resources are "merchantable"—and by no means all of this is large enough for lumber In view of the enormous increase in consumption of timber during recent years, Canada, like her southern neighbour, will ultimately be driven, no doubt, to renew her stocks by establishing plantations, for even where natural replacement has occurred, as in the burnt-out areas, the tendency is always for the valuable early species to be succeeded by such forest "weeds" as the aspen Yet the Dominion is still second only to Soviet Russia in the possession of reserves of softwood timber Her coniferous forests stretch across the country in a broad belt from the Atlantic to the Pacific, from just north of the St Lawrence river, in whose basin is a minor area of hardwoods which has been largely cleared, north of the Great Lakes, north of the prairies, then sweeping westwards and southwards over the Rockies and into British Columbia North of the prairies, however, the timber is cut for supply to that agricultural region, and large-scale production is important in the eastern provinces, chiefly northern Ontario and Quebec, and in British Columbia

Transportation of the lumber by waterway is possible and is practised to a much greater extent than in the northwestern United States Felling of the trees usually commences in the autumn, before the snow has become too deep, then the logs are hauled to the frozen streams and piled up on the ice When the spring thaw comes, and the ice and snow melt, the logs float down the river, and after being sorted at some convenient spot are conveyed to sawmill or pulp factory Those very climatic conditions which are hostile to agriculture—notably the long, severe winters—over most of the coniferous forest region are thus of peculiar advantage to the lumber industry the early snow cover facilitates haulage to the rivers, while the winter freezing and the spring flooding of the latter permit the cheapest form of transportation downstream An interesting result of this is that where agricultural land is close to the forests, as in Quebec, the farmer often enhances his income by turning lumberjack for the winter

In eastern Canada, where the spruce and the white pine are the principal softwoods, Ottawa has become a leading centre of the pulp and paper manufacturing industries But the province foremost in lumber production is British Columbia, which specialises in Canada's other outstanding softwood tree, the magnificent Douglas fir—for her justly renowned forests along the Pacific slopes of the Cascade Range are a northward extension of the Washington forests There the timber is still large, and in addition to sawn lumber, millions of railway sleepers, telegraph and telephone poles, and posts are produced annually In Ontario and Quebec, on the other hand, the chief consumers of the raw material of the forests are the pulp and paper mills, and the cut trees are generally of much smaller size During recent years the total value of Canada's exports of wood, wood pulp, and newsprint together has exceeded that of wheat, and an equally significant feature of the industry is that whereas there has been a slight downward trend in sales of lumber, the relative value of exports of wood pulp has shown a moderate increase—of paper a very considerable increase—a feature which is strikingly indicative of the country's growing industrialisation

On the continent of Europe there is such a deficiency of softwood timber that more than one-third of the total amount consumed has to be imported Efforts are being made in some countries to bolster the supply from domestic plantations, with notable success in France, while the natural growth of mountain forests in the Balkans and in central Europe provide Yugoslavia, Austria, and Czechoslovakia, for instance, with a surplus of merchantable timber, but the only area able to export on the large scale is that lying wholly or principally within the northern coniferous forest belt—the U S S R , Norway, Sweden, and Finland For long the lofty tableland of Scandinavia has been one of the world's main lumbering regions On the Atlantic side this plateau falls sharply and steeply to the ocean, and is cut by the long, narrow Norwegian fiords There is thus little space for agriculture in Norway, the inhabitants early became either lumbermen or fishermen and sailors, and her forests and fisheries furnish the country's chief resources In Sweden the mountains descend much more gradually towards the sea and while the northern part of the country is well forested, the lowland provinces in the south are mainly agricultural, where the two regions are contiguous, the inhabitants, again, habitually combine the two occupations of farming and lumbering Sweden, being on the whole a much less mountainous country than its neighbour, is to a much greater degree covered with forests—more than one-half of its total surface, in fact, compared with about one-quarter of Norway's area, and the latter country now has a relatively small amount of timber left available for export

Pine and fir lumber from both Sweden and Norway is extremely hard and durable, for the tree-rings are closely spaced on account of the short growing-seasons, but the proportion of timber, which together with wood pulp, paper, and matches form their most valuable exports, is decreasing as that of the manufactured and semi-manufactured wood products is increasing A tremendous fillip has been given to the Swedish industry by the improvement of thousands of miles of waterways along the country's rivers, in order to facilitate the log-driving down to the coast at the spring floods, rapids and shallows have been removed, channels have been constructed, masses of floating logs are anchored along the banks One grave disadvantage suffered by all the sawmill towns on the Gulf of Bothnia, however, is that they are ice-bound during the winter months

Finland, too, has its seaports blocked for part of the year Except for a narrow agricultural strip in the extreme south, this country consists of a low plateau of pine, spruce, and fir forests flecked with long, narrow lakes, more than half of her total area being covered with conifers An even greater part of her exports, of late years more than four-fifths, is thus represented by wood and wood products, including in this case a considerable quantity of pit props, and once more the processed articles have rapidly assumed major importance, the most spectacular change has been in the manufacture of wood pulp, the shipments of which increased in one decade, from the mid-'twenties to the mid-'thirties, from just over one per cent in value of the country's total exports to over twenty-five per cent Great Britain, the world's heaviest buyer of both timber and wood pulp, imports from Finland, Sweden, and Norway, as well as from Canada and Soviet Russia

By far the greatest reserves of untouched softwood timber left in the world lie in the coniferous forests of the U S S.R , which cover a vast area stretching the entire width of the country from the Finnish border to the Pacific Ocean To the north it passes into the tundra, in European Russia its southern edge approximates to the latitude of Leningrad, but swings southwards in a narrow tongue covering the slopes of the Ural Mountains—recalling the similar mountainous forest area of the north-western United States—and again extending well southwards in the eastern half of Siberia South of the true coniferous forest of European Russia the pine, spruce, fir, and larch mingle with such broad-leaved deciduous trees as the oak and the beech, while considerable areas here have been cleared for agriculture, but this mixed forest belt does not altogether disappear till about the latitude of Kiev Over the major part of the country the products of the forests have thus always taken a pre-eminent place in the economic life of the inhabitants, houses and huts have been built of timber, wooden ploughs and other implements in the past have tilled the soil, wood fuel has provided warmth in the harsh winters, the bark of certain trees has provided tanning materials This close bond between the Russian and his forests is not likely to be materially loosened, for in the coniferous area at least, climatic conditions are in general hostile to agriculture, and even where they would permit the growth of crops, the soil is too poor As a consequence, the forest policy will doubtless continue to be one of careful conservation

In the past only the more accessible softwood resources, especially those of European Russia, were tapped When the timber had been cut, it was floated down the long rivers to the sawmills and the pulp and paper mills, the hinterlands of Leningrad and Archangel became particularly important, and the connection of the former with the lumber trade has been strengthened by the specialisation of its shipbuilding industry in the construction of timber ships and ice-breakers Murmansk has become a leading timber port, having the advantage over Archangel, which is ice-bound for six months, of being open throughout the year This blocking of most of the northern ports by ice is a serious handicap to the lumber industry, for nearly all the long rivers which cut through the coniferous forests, and down which the logs are driven during the summer, flow northwards into the Arctic Ocean But under the Soviet Government there has been a great expansion in forest exploitation, and now planes and ice-breakers pilot the timber ships down the rivers, and the Arctic coast is acquiring increased significance in Russian external trade At the same time, axe and saw are being replaced in the forest by timber-cutting machinery, roads are being constructed so that the lumber may be hauled by tractors rather than horses, huge state combines are developing the manufacture of wood pulp and paper, scientific methods of afforestation are being applied

Difficulties of exploitation and transportation of the timber are immeasurably greater in the Siberian taiga, or coniferous forest, than in the western section of the region In the first place, the upper reaches of such immensely long rivers as the Yenisei and the Ob—each of which covers well over 2,500 miles and the entire north-to-south breadth of Siberia—melt at a much earlier date than the lower reaches, with the result that the rivers flood extensively over the plain Then, as we have already remarked, marshland occupies a high proportion of the forest area These obstacles, too, the Soviet Government has begun to surmount under the Five-Year plans the large-scale drainage of the marshes has been inaugurated —"caravans" of timber ships preceded by planes and ice-breakers now regularly travel down the Yenisei with lumber for export, and more and more of the vast, lonely stretches of the taiga is being made to yield its untouched wealth Nevertheless, this additional exploitation represents only a small part of the increase of resources by natural growth, and world markets, which otherwise must be faced with an acute shortage of softwoods, will depend upon the continued expansion of the Soviet timber industry.

Chapter 10

STOREHOUSES OF POWER

THROUGHOUT the long initial stages of man's progress, the only power he possessed to help him utilise natural wealth was what he could provide from his own muscle and sinew Even to-day there are primitive tribes whose resources are limited to their capacities for gathering and fashioning by their own hands At a later date, he discovered that much greater amounts of work could be performed, cheaply and conveniently, by domesticated animals, and the institution of slavery enabled a privileged minority to enjoy increased luxury and ease by exploiting a mass of hewers of wood and drawers of water at the cost of feeding them and keeping them healthy Then, by rather crude methods, he harnessed the forces derived from such natural phenomena as running water and moving air masses—water mills and windmills partially supplanted the efforts of animals and humans. Not until certain fuels, especially coal, which for centuries had been employed for heating homes, were diverted to the production of steam did mechanical power on a large scale come to the aid of mankind, and, in time, release a tremendous, hitherto unimagined fund of wealth upon the world

With the invention of the steam engine, a relatively modern event in terms of world history, came a gradual but remarkable transformation in modes of life, and often in the actual geographical environment over a large portion of the globe New resources could be extracted from the earth, and the old were produced in incredibly larger measure, new methods of transportation facilitated a much wider distribution of these resources The movement from the home to the factory of processes for manufacturing raw materials into consumable commodities, begun with the first adoption of mechanical power, expanded to such proportions that industrial regions, with their attendant furnaces, chimney stacks, pitheads, railroad sidings, became a common feature of the landscape in the more progressive countries Mechanised power abolished drudgery from the lives of many, at any rate, of the human race, leisure and a modicum of luxury were now not so much the prerogative of the rich and noble In the modern age, mechanical power is to the same degree taken for granted as slavery was accepted under the Roman civilisation, and so, too, are the social and political difficulties that it has evolved, it is nowadays the mainspring of the activities involved in the extraction, transportation, and utilisation of the world's wealth Its sources have become so essential to the prosperity of the industrial nations that they represent some of the most valuable elements of that wealth

Of the basic sources of power, the three principal are coal, oil, and water power—commonly known as "white coal"—for electricity, coal gas and natural gas, and petrol are merely derivatives of these Other sources will, no doubt, appear, of which the first seems likely to be atomic energy, it seems probable, too, that our conceptions of the scope of mechanical power will be revolutionised anew Meanwhile, reflecting upon the known, we may note that the three main sources of power, coming from neither vegetable nor animal kingdoms, do not occur in any particular climatic regions A distinction between the two mineral fuels, coal and oil, on the one hand, and "white coal" on the other, is that the first two are exploited according to "robber economy"—once taken from the earth, they cannot be renewed—whereas the energy obtained from falling water is replenished from year to year by the normal deposits of rain As long as the three sources of power are not challenged by a new source, then, the stocks of coal and oil will be constantly diminishing, and in the long run those countries possessing the amplest reserves of "white coal" may be in the strongest industrial position

At present, coal remains the chief source of fuel and power, and, in general, the leading industrial nations of the world, United States, Great Britain, Germany—unless by the peace terms her manufacturing potentialities are deliberately stifled—and more recently Soviet Russia, are the principal coal producers Coal exists in a variety of types, due to its formation from buried vegetation In its most primitive form it still retains a high content of moisture, displays its vegetable origin in appearance and properties, and is known as peat There are heavy deposits of peat in many of the cooler parts of the northern hemisphere, but its bulk militates against a wide commercial application, and it is only of importance in those areas—notably in Ireland—in which it can be cheaply worked and where more efficient fuels are not readily accessible, it occurs in bogs, and is dried before being burned Lignite, or brown coal, represents a later stage in the transformation from vegetable matter to coal, but still possesses a fairly large amount of moisture and a relatively small proportion of carbon Again, it is valuable particularly where there is a deficiency of true coal, but, although it is reckoned to be equivalent to less than one-fifth by weight of the latter, its value has been considerably increased, for example in Germany, by conversion to electrical power on the spot

In contrast to the brownish hue of lignite, bituminous coal is usually black, it constitutes more than half of the world's coal resources, and is the type most extensively consumed in industry According to their value in producing coke, the fuel needed for the blast furnaces of the iron and steel industry, bituminous coals are further classified as coking or non-coking The hard, jet-black anthracite, of the commercial coals the one farthest developed from its vegetable origin, has a low moisture and a high carbon content, and although rather difficult to ignite burns steadily and emits little smoke, it is therefore the most popular type of coal for heating homes and business premises One feature characteristic of all varieties of coal, and specially significant in those utilised as fuel by the manufacturing industries, is their extreme bulk and weight compared with those of the raw materials, so that it was usually more profitable to transport the latter to the coal rather than the coal to them As a result, industries tended to cluster round the coalfields, a trend that has been particularly marked in Great Britain Since oil and electricity have come to the fore, however, this centralisation of industries has begun to diminish oil can be easily conveyed by pipe-line to centres far away from the oilfields, and industries rarely arise near to the source of the fuel, while electricity generated at the pithead or the waterfall can be conveniently and instantaneously transmitted long distances to the consumer

More than one-third of the total world output of coal is mined in the United States, and, although estimates are necessarily approximate and show considerable variations, that country is considered to possess the greatest reserves Nearly three-quarters of her production comes from the massive Appalachian fields, which extend from north-west Pennsylvania through West Virginia to northern Alabama, and are sub-divided into the northern, southern, and mid-Appalachian fields On this area, from the industrial standpoint probably the world's foremost coal region, the mass of great manufacturing centres in the eastern states, as well as those to its immediate west, are very largely dependent, and it contains four of the five leading coal states—Pennsylvania, West Virginia, Kentucky, and Ohio From the northern field, lying in western Pennsylvania and covering part of Ohio and northern West Virginia, is extracted the best coking coal, demanded by the huge iron and steel works of Pittsburgh—placed approximately at the centre of the western Pennsylvania area—and

Cleveland. Within the mid-Appalachian deposits of Kentucky, West Virginia, and Virginia lies the famous Pocahontas field, which supplies the finest American steam coal. Alabama and Tennessee contain the southern field, which in recent years has seen a rapid expansion of output, bringing about the industrial development of Birmingham, "the Pittsburgh of the south."

These Appalachian bituminous coal-beds have won supremacy on the basis of their enormous extent, the favourable conditions for mining, and the high quality of the fuel—for it has a high heat value and stores well. Apart from their prime function of supplying power and fuel directly to the intricate railroad network and to the factories and blast furnaces of the east, they are also of vital importance for the manufacture of coal gas and electricity, and, in this densely populated area, for domestic heating. Detached from the northern section of the Appalachian fields and situated in eastern Pennsylvania is a group of anthracite deposits which together have the largest output of this type of coal in the world. Although this output only amounts to between ten per cent and fifteen per cent of the total national production, in the industrial cities and towns of the north-east the coal is in unrivalled demand for heating purposes.

To the west of the Appalachians are other deposits known respectively as the Northern, Southern, Western, and Eastern Interior coalfields, of which the last is the most important. This Eastern Interior area is particularly well blessed with both the quantity and quality of its yields and the comparatively low cost of mining, and serves the Chicago and St. Louis districts and other nearby industrial centres. Covering much of Illinois, it has given that state third place to Pennsylvania and West Virginia in national output, and extends also into Indiana and Kentucky. Detroit and neighbourhood are supplied from the much less extensive Northern Interior field just south of Lake Huron, in Michigan. The Western Interior field occupies a wide area from Iowa through Kansas and Missouri to Oklahoma and Arkansas, but despite the low production costs and high heat value of its bituminous coal, it suffers the disadvantage of remoteness from the main industrial areas and, being so far west, from competition with petroleum and natural gas The Southern Interior fields of central Texas are of negligible economic value Of the remaining United States fields, those of the Rocky Mountain states alone are worthy of note, for although the output is small, the coal is valuable in supplying the trans-continental railways and, locally, in providing fuel for the smelting of metallic ores

Her coalfields were largely responsible for achieving the same broad end of industrial progress for the United States as the British coalfields for Great Britain, but there are striking dissimilarities in the ways in which the development has taken place The first notable distinction is that, except for the establishment of the iron and steel industries on the Pennsylvania coalfield and the later development of centres like Birmingham, Alabama, there has been no marked industrial concentration around the coalfields, and the manufacturing towns in New England and beside Lakes Erie and Michigan are placed some distance from their sources of coal Again, being situated well inland, unlike the British deposits, the American fields have not acquired a heavy export trade, for the cost of transportation to the coasts has in general proved prohibitive, about three per cent to five per cent of the national output enters external trade, against about twenty per cent, in normal years, of the British coal Almost all of this exported fuel goes to Canada from Pennsylvania, whose fields occupy an extraordinarily favourable position for the trade they are relatively close to the more densely populated centres of southern Canada, while the Great Lakes furnish a means of cheap haulage All the operating fields, however, have been deeply concerned in the agricultural development of the

Middle West and the Rockies and the parallel industrial development of the east, at various stages across the continent the mines provide convenient refuelling centres for the long-distance railroads, and the close connection between the coal industry and the country's massive internal trade is indicated by the extremely high proportion of the output consumed by these railroads

Second to the United States among the coal-producing nations is Great Britain, her output is actually exceeded by Germany's, but about half of the German fuel consists of lignite, which in value to industry cannot be compared weight for weight with true coal An outstanding feature of the British coal-mining industry is the large fraction of its produce that is normally exported· a development which has been encouraged by the proximity of all the coalfields to the coast, and also by the geographical position of the British Isles, conveniently near to such areas as France, Denmark, Scandinavia, and the Mediterranean countries, which are deficient in coal Indeed, the Tyne estuary, whose ports led by Newcastle played an early part in the export trade, practically bisects the important Northumberland and Durham coalfield A heavy foreign demand for the so-called "smokeless" coal from the eastern end of the South Wales coalfield caused Cardiff to surpass Newcastle in exports, though the latter remained pre-eminent in supplying colliers which ply the coastal trade—carrying coals to domestic centres like London, relatively remote from the mines

On the basis of bulk alone, coal for long occupied the chief place in British exports, and its shipment abroad enabled returning merchantmen to transport for low freightage rates some of the vast amount of imported foodstuffs and raw materials that these islands require Much of the fuel has also gone to overseas coaling-stations, where it has been picked up by British steamships, and still more has been taken on by the latter as bunker-coal at British ports though in both cases competition is being felt from oil The heyday of British coal exports was reached just prior to the first World War Later the general dislocation of world commerce stimulated coal production in areas that Great Britain had formerly supplied, and, in spite of some fluctuations during the inter-war period, the export trade never altogether recovered

As in the United States, coal was the foundation of industrial prosperity in Great Britain, and of the world supremacy in manufactures which the country once enjoyed, to a far greater extent in modern times, however, has it been the driving force behind industry, for practically no petroleum or natural gas has been discovered in these islands, and singularly small reserves of water power have been developed Approximately nine-tenths of the national output of minerals, in fact, consists of bituminous coal and anthracite When an industrial nation relies so heavily for its power resources on one type of fuel, it is inevitable that its economic welfare shall be peculiarly sensitive to the state of the producing industry on the domestic side, the loss of foreign trade and competition with other fuels were aggravated by inefficient methods of mining and marketing, the continued working of uneconomic pits, and other factors—all combining to present the country with a problem that can only be solved by bold and drastic action

One of the areas to suffer most severely was the highly important South Wales coalfield, which leads both in production and exports Like other British fields, it owed its early large-scale development to the existence within the region of extensive beds of iron ore, fuel and metallic ore in close proximity evolving a mighty iron industry, the local ore is now scarcely worked, a superior type being imported, but the tinplate industry, as well as copper smelting, have clung to the coalfield An unusual characteristic of this coalfield is that in the east are mined domestic heating coals, to the west steam coals, and still farther west anthracite.

In the north and Midlands of England are a number of isolated beds lying on both sides of the Pennines, each of which is closely associated with a certain industry or group of industries The Yorkshire coalfield, for instance, supplies the adjacent woollen mills of the Leeds-Bradford district and the steel works of Sheffield; to the south it continues as the Nottinghamshire and Derbyshire coalfield, from which the Nottingham lace, hosiery, and leather factories draw their fuel, while still farther southwards the Leicestershire deposits support the manufacture of a similar range of products in Leicester One of the Midlands coalfields, the North Staffordshire, is alone in still maintaining a considerable output of iron ore; it mainly feeds the characteristic earthenware industry of the Potteries, and the South Staffordshire deposits the hardware industries of the Black Country and Birmingham Iron smelting and shipbuilding have developed on the Northumberland and Durham coalfield, being assisted by the iron-ore deposits of the North Riding of Yorkshire, and salt mines in the neighbourhood have given rise to the Tyneside chemical industry West of the Pennines, the Lancashire manufacturers of cotton goods, centred on Manchester, and of machinery, chemicals, glass, and other products, draw upon the coalfield of that county

All the Scottish coal areas lie in the Midland Valley, between the Southern Uplands and the Grampians, and owed their early industrial associations largely to the occurrence nearby of iron ores, which have now declined to secondary importance, the most extensive, the Lanarkshire field, is the source of fuel for the blast furnaces, steel mills, and shipbuilding yards of Clydeside and the textile and other factories of Glasgow, the Midlothian field feeds the Edinburgh district, and the Ayrshire and Fifeshire fields the industrial towns of their own areas No further emphasis need now be laid, perhaps, on the ties which have bound the individual British coalfields to certain industries, or on the close interdependence between mine and factory in the development and maintenance of national prosperity

Great Britain's most formidable rival in the coal export trade has been Germany, the third major producer After the first World War, the German industry, too, was penalised by the reduction of external markets, and the coal-owners of both countries fought a bitter struggle for trade in France and southern Europe Trade agreements were sometimes made with purchasing nations, and British exports were assisted by subsidies—whereat the Germans retaliated by giving preferential freightage rates to their coal, but the problem was not to be solved by such piecemeal methods Furthermore, Germany had lost the major portion of her former Upper Silesian coalfield, most of which had been acquired by Poland and another section by Czechoslovakia, while the deposits of the Saar basin, on the Franco-German border, were temporarily operated by the French On the other hand, the great Ruhr coalfield, responsible for about three-quarters of the total production of bituminous and anthracite coal, was retained in its entirety, and during the inter-war years the national output showed a pronounced upward trend while in Great Britain it was declining This valley of the Ruhr, one of the Rhine tributaries, yields easily-mined coal of excellent quality which, with readily accessible iron ore, established within the area one of the world's mightiest iron and steel industries, associated with such cities as Essen, Dortmund, and Dusseldorf, much of the former plant has been destroyed, of course, in World War II, but doubtless will ultimately be restored

Ruhr coke is also in demand for iron smelting throughout the remainder of industrial north-west Europe Though there has been less concentration of the textile industries than in Great Britain, they have to a considerable extent collected around the Ruhr and other coalfields Cotton manufacturing centred on Chemnitz, "the Manchester of

Saxony," for example, has been supplied from the small bituminous deposits in the vicinity, the woollen town of Aachen has drawn upon the small detached basin that runs from Belgium across the German frontier Lignite, mined chiefly near the foot of the Erz Gebirge, in Saxony, has achieved economic importance by reason of its use firstly in the generation of electricity on the coalfield, secondly in the manufacture of mineral oil, and it may well become an even more valuable part of the country's fuel and power resources

A noteworthy aspect of the disorder of the coal industry in the three main producing countries during the inter-war period was the effect on the miners, whose economic welfare—as they form an appreciable proportion of the working population—materially influences the welfare of the entire community In the savage competition for foreign markets, both British and German coalowners attempted to cut their losses by reducing wages and increasing hours of work, unemployment was rife, and in Great Britain, from the mid-'twenties to the mid-'thirties the number of men in work at all fell from 1,100,000 to less than 420,000 Production in the United States was constantly in excess of consumption, the mines were usually operating for slightly more than one-half of the year, periods of trade slackness affected nearly 750,000 miners, and one in every four was classed as "surplus labour" Social conditions were a reflection of the state of the industry worst of all, perhaps, on some of the American coalfields, where the collections of dilapidated, insanitary dwellings, frequently owned by the mining companies, condemned miners and their dependants to lives of unremitting ugliness and wretchedness There are signs now of recognition that this state of affairs is economically as well as socially reprehensible But the likelihood that the problems of the coal industry—and of power resources generally—are to be tackled internationally is less apparent

While chaos characterised production in the principal areas, the coal industry in Soviet Russia was passing through an era—after the initial decline during the Revolution—of remarkable expansion Possessing within her vast territory enormous reserves, the U S S R both increased the output from the older coalfields and, more significantly, opened up many of the hitherto untapped resources elsewhere, especially in Asiatic Russia, as part of the national plan to effect complete industrialisation of the country and also a redistribution, so that industries should be located where power and raw materials were readily available By 1928 the pre-Soviet output had been exceeded, seven years later this quantity had been more than trebled, and the execution of the Five-Year plans raised the country to fourth place among world producers

Easily the most important of the coalfields is still the Donets basin of the Ukraine, whose anthracite and bituminous coal production was more than doubled as its proportion of the national output decreased Being situated conveniently near to the famous iron-ore deposits of Krivoi Rog, it supplies the fuel for the immense iron and steel industries of both districts and of Rostov, and the tractor industry of Kharkov Formerly the Donets basin was also the chief source of fuel for the textile, chemical, and machine-making industries of the Moscow area, but now the lignite of the Tula basin, just south of Moscow, is being exploited to a much greater extent, and costly transportation has been much reduced During World War II the equipment of most of the mines in both these fields was destroyed, and will now have to be restored

Expansion in all other areas has been completely eclipsed by the gigantic increase in production in the Kuznetsk basin of western Siberia, which holds reserves estimated to be superior to any in the Union, though before the Revolution it was merely utilised for refuelling the locomotives of the Trans-Siberian railroad At the same time the rich iron deposits of Magnet Mountain, about 1,200 miles to the west in the Urals, were exploited. Coal from the Kuznetsk basin was exchanged for ore, and at both ends of the Ural-Kuznetsk Combine groups of new iron and steel centres like the now celebrated Magnitogorsk, near Magnet Mountain, arose Substantial reserves of coal also exist in the largely unexplored Tunguska and Lena basins of central Siberia, the better-known Irkutsk, Kansk, and Minusinsk basins to the south, the Bureinsk basin in the Far East, the Karaganda basin of Kazakhstan, and the Pechora basin in the Arctic tundra of European Russia There is small doubt that when her wartime losses have been made good, the coal output of the U S S R will have overtaken that of Germany, and at the pre-war rate of expansion she may conceivably in a few years wrest second place in world production from Great Britain, it is equally probable that the fuel will continue to be consumed almost exclusively by domestic industries

In Europe another coalfield of importance is the long, narrow basin running eastwards from near the straits of Dover across north-east France and southern Belgium It yields most of France's home-produced coal, which has to be supplemented by imports, and feeds the thickly populated industrial areas around Lille and the Liége-Namur region of Belgium On the continent of Asia, China is known to have very considerable reserves, but the output, if Manchuria be excluded, is still below that of Belgium, on the basis of her fuel resources, China may well become one of the world's leading industrial nations Japanese production from coalfields on the islands of Kyushu and Hokkaido is much higher, and has been largely responsible for the country's rapid industrialisation, but the reserves are relatively small

ROCK OIL AND WHITE COAL

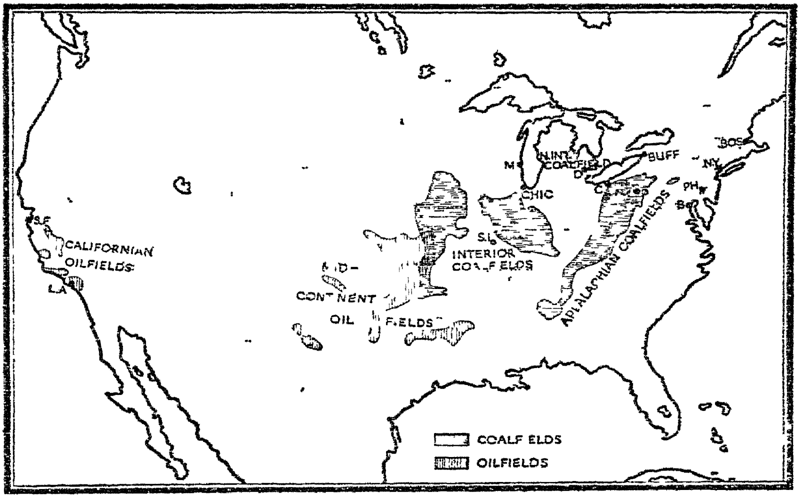
After coal, petroleum—literally "rock oil"—has become the world's chief mineral and the source of about one-quarter of its power, a development which has taken place mainly since the beginning of this century through the phenomenal expansion of road and air transport Its principal use is the production of fuels and lubricants for the millions of automobiles and lorries which now thread the earth's highways and byways and the thousands of planes which traverse the skies, in war it is indispensable to the belligerent nations, and the remark of a statesman after the first World War that "the Allies floated to victory on a sea of oil" could be applied even more accurately to the result of the second great struggle Besides petrol, its most valuable product, it is the source of kerosene, lubricating oils, heavy fuel oils, greases, asphalt for road-making and paraffin wax for candles, and among the minor derivatives such commodities as vaseline and medicinal paraffin

Petroleum is usually secreted in subterranean pools in certain rocks at spots where the strata have folded upwards into an anticline, the oil floats on the surface of any water that is present, and above the oil is a layer of natural gas—another source of light and heat, that has been widely utilised, for instance, in the United States On account of the fluid nature of the oil, the area drained by a single well varies considerably, and the life of the latter may be prolonged, or, on the other hand, production may rise suddenly to stupendous heights and yet within two or three years have declined to insignificant proportions—as happened on some American fields There are substantial variations, too, in the composition of the crude oil By modern practice the yield of oils which are rich in petrol is usually increased by "cracking" into petrol and still heavier oils, those which are comparatively poor in petrol are often consumed in the crude state, for instance, in oil-burning steamships In addition to its abundance and cheapness and its wide range of by-products, a great advantage of petroleum as a power resource is the ease with which it may be transported; the most efficient and up-to-date method of overland conveyance from the oilfield is by pipe-line, a method which has been now applied also to transmission of petrol and natural gas, while the vast quantities entering international trade are carried across the oceans by fleets of specially constructed oil tankers

The production of oil differs from that of coal or "white coal" in that it is controlled by a few powerful operating companies whose activities have spread, if the U S S R be excepted, into all the major oilfields, and are mainly of American, British, and Dutch origin Two leading groups dominate the industry, one American, the other Anglo-Dutch, and the nationals of the territory where the oil exists have in general taken but a minor rôle in its exploitation Though American capital has obtained considerable influence in foreign spheres, its main contribution has been in the development of the remarkably rich domestic fields, there its policy, in brief, has been to encourage quick and heavy output, frequently leading to an appreciable fall in prices and the attendant evils of over-production Great Britain, on the other hand, is practically devoid of oil, and her efforts have been devoted to the acquisition of prospecting rights and concessions in various parts of the world, the Anglo-Dutch policy has been aimed at a steady production of oil and the conservation of supplies with an eye to the future British interests are paramount in Iran, Iraq, and Burma, Dutch in the Dutch East Indies, while British, Dutch, and American capital is involved in the oilfields of Central and South America and Rumania With her close economic dependence on the maintenance of merchant shipping routes, Great Britain, too, has provided the same refuelling facilities along the Imperial life-lines for oil-burning steamships as existed when coal was the only bunker fuel

In output of oil, as of coal, the United States has for long been supreme among the nations, being responsible for slightly less than two-thirds of the total world production But an important distinction is that a fairly high proportion of the oil is exported to such industrialised countries as Great Britain, France, and Japan, which are deficient in the fuel Against the heavy exports of refined products, however, there is also a considerable import of crude oil from Venezuela and Mexico to feed the enormous domestic consumption, which is closely linked to the country's massive automobile industry During the early days development was confined to the eastern states, and the first well was drilled in Pennsylvania in 1859, nearly thirty years later this state alone produced ninety-five per cent of American oil After the initial boom, however, followed by over-production and a disastrous slump, and with the discovery of new wells elsewhere, the Appalachian field, which roughly covers the same area as the coalfield, declined to a position of secondary significance From the beginning, the marketing side of the industry gradually became vested in the hands of a single company, which was supplied by a struggling swarm of independent producers on the oilfields, this same tendency to integration is apparent to-day, but on a wider scale, the few dominant interests being in control of oilfields, pipelines, refineries, tankers, and oil-bunkering installations at the principal world seaports

Nowadays by far the richest fields are those of the Mid-Continent area, mainly in Kansas, Oklahoma, and northern Texas, and extending eastwards into northern Louisiana and southern Arkansas, the most prolific oil region in the world Despite the phenomenal rise in output of many of them after the first "gusher," and the inevitable diminution of reserves, the probability is that this Mid-Continent province will remain the major producing region of the United States For some years the state which led in production was California, but lately she has been superseded by both Texas and Oklahoma, her temporary eminence followed a number of spectacular strikes, principally in the Los Angeles Basin, which was the primary cause of Los Angeles becoming the first American city on the Pacific coast Although "wildcat" operating was sometimes crowned with success, the sad sequence of frenzied boom conditions, with over-close, uneconomic drilling, then the saturation of markets and the collapse of prices, and depression, was again unfolded Later, after enormous amounts of oil had been wasted, a limitation of output was imposed in California in order to preserve the high pressure of the natural gas firstly, so that the gas could be put to industrial use, secondly so as not to impair the petroleum yields, but there are already signs of a permanent decline in pro-



The principal coalfields and oilfields of the United States—the most productive in the world, the chief industrial centres are shown, and it will be noted how many are located in the north-east, near to the coalfields duction Third among the leading American oil-producing areas is the Gulf Coast Province, lying along the coastal plains of Texas and Louisiana Unlike the products of the Mid-Continent Province, which vary from the highest to the lowest quality, the petroleum of this region is mostly poor in petrol content, and so is to a large extent consumed in the crude state by oil-burning ships On a minor scale crude oil is also mined in Illinois, Ohio, and Indiana —which have shown drastic declines in output since their boom periods of thirty to forty years ago—Michigan, and a widely scattered collection of fields in the Rocky Mountain states

Second to the United States in output is Soviet Russia Though this amounts at present to only one-fifth to one-sixth of the American, her untapped resources are known to be tremendous, and altogether she is estimated to possess about one-third of the world's reserves Under the Soviet regime the volume of oil produced has been increased steadily to more than three hundred per cent of the pre-Revolution output, and, again, in accordance with the plan for regional industrialisation, new fields are being developed, and transportation of the crude oil is being eliminated by establishing refineries near to the wells

By far the most prolific oilfields, however, are still those on the southern side of the Caucasus Mountains, the richer being that located in a limited area around Baku, Russia's leading oil centre and now the third city in the Union The existence of inflammable oils there was known centuries ago, and since large-scale exploitation began the district has always dominated the Russian petroleum industry Oil is conveyed by pipe-line from Baku along the southern flanks of the Caucasus Mountains through the second Transcaucasian oilfield near Tbilisi (Tiflis) and on to Batum, but the quantity exported from this Black Sea port tends to decrease as the demands of domestic industries rise On the northern side of the mountain range the abundant Grozny oilfield ranks second to Baku, though well behind in actual yields, while the Maikop district near to the Black Sea coast has come well to the fore in recent years Of the remaining areas, none yet produces on more than a comparatively small scale, though many have been brought into active operation In the Far East there are oil wells on the island of Sakhalin, and in the peninsula of Kamchatka, but the source of greatest potential wealth to be revealed by recent geological surveys is a long chain of oil-bearing rocks running down the western flanks of the Ural Mountains, from the most northerly region near to the Pechora coal basin as far south as the steppes just north of the Caspian Sea

Close behind the U S S R in oil production is Venezuela, both countries are well ahead of their nearest rivals and appear to have ample unmined reserves, so that they will doubtless retain their present positions in world output A noteworthy distinction, however, is that Venezuelan petroleum is exploited almost entirely for export, and is under the control of foreign capital—namely, the two groups, Anglo-Dutch and American, which dominate the international trade Recent development has been even more spectacular than in Soviet Russia, in the decade following the first major production in 1923, the country's exports as a whole were quadrupled in value, and of this rapidly increased external trade the proportion of oil products rose from less than twenty per cent to almost ninety per cent, whilst there was a corresponding decrease in the relative importance of coffee and cocoa This exploitation of petroleum and asphalt, in fact, has had a remarkable effect on the economic progress of the country All the richest wells are situated round the shallow Gulf of Maracaibo, whose entrance is only accessible to tankers of unusually light draught These specially constructed vessels convey the crude oil to the nearby Dutch islands of Curaçao and Aruba, where the great majority is treated in the refineries before being exported, some of the petroleum, however, is transferred in the crude state in the deep-water ports of these islands to ocean-going tankers, which then carry it to refineries in the United States or Europe.

Among many of the less eminent producers, petroleum forms the most valuable item in the national exports: for Rumania, for example, after the U.S.S.R. owning the richest oil-wells in Europe, where again foreign capital interests are powerful, the oil is mined on the flanks of the Carpathian Mountains, is refined at Ploesti, and sent by pipe-line to the Black Sea port of Constanza. Nearly three-quarters of the total exports of Iran are represented by oil, a prolific and developing field exists at Masjid-i-Sulaiman in the south-west, the crude oil being conveyed by pipe-line to refineries on the island of Abadan, near the Persian Gulf. Oil from the wells near Kirkuk, in north-eastern Iraq, is transmitted as far as Haditha, on the Euphrates, by pipe-line, which then bifurcates across the desert to Tripoli and Haifa on the Mediterranean coast. Dutch capital is predominant in the oilfields of Java, Sumatra, and Borneo, in the Dutch East Indies, but American and British interests in those of Mexico were expropriated in 1938 by the Mexican Government. Although petroleum is still first among Mexican exports, during the last twenty years—the period of the rapid Venezuelan expansion—the country sank from second to sixth place among world producers, partly owing to political factors and partly to the exhaustion of many of the wells, these lie mainly round the oil port of Tampico, on the Gulf of Mexico.

While the enormous world demand for petroleum is at present more than fulfilled from existing oilfields, it is not considered likely that any new major petroliferous regions are still to be discovered, but that consumption will have to be maintained by opening new fields in those already known. It is very probable, in fact, that our oil supplies will be exhausted long before the last coal resources have been even tapped—though by that date, possibly, new forms of power may have supplanted both coal and oil. Meanwhile, many countries which are rich in coal deposits but lacking in oil-wells, such as Great Britain and Germany, have already turned their attention to the conversion of solid into liquid fuel, and to a lesser degree oil shales have been used for the same purpose.

On the other hand, countries deficient in both coal and oil have sometimes been able to develop water power to a remarkable extent. Our location of the principal deposits of the two mineral fuels have shown that they largely occur in lowland regions, whereas water can be most readily transformed into mechanical energy in mountainous areas where there is a substantial or constant rainfall, this transformation has thus reached its most extensive development in such mountainous lands as Norway and Switzerland, and in those parts of more spacious countries like the United States which are remote from coal or oil. It has been estimated that every installed horse-power of this type of energy can save these areas six tons of coal annually. For many centuries man has utilised running water as a source of power, but not until comparatively recent years has the invention of the turbine and the dynamo, by facilitating its conversion into electrical energy, raised it to major significance. In principle the hydro-electric plant simply imitates the natural waterfall: the water that is available at high level is diverted into long tubes, known as penstocks, which run down the mountain slope to the turbines in the valley below, and so enable the water to generate electricity. It was the permanent ice and snow fields of the high Alps, providing a steady flow of water, which caused the French to originate the name "white coal"—a name which is now indiscriminately applied to all hydro-electric power.

Both in actual production of water power and in unexploited resources the United States leads the world

Development has been greatest in the northern part of the country, which, with its profusion of lakes and rivers and its fairly lavish rainfall, and in the north-east particularly the proximity of the major centres of population, is geographically the best favoured. Some of the most important installations are those utilising the Niagara Falls, which on the American side supply such towns as Buffalo and an appreciable area of the state of New York. Streams descending from the Appalachian Mountains provide numerous industrial towns of the New England and Atlantic states with electricity, especially in the south, where the range reaches its highest altitudes. On the south-western flank the world-famous Tennessee Valley Authority project has harnessed the waters of the Tennessee River through its entire length from the source to its confluence with the Ohio River, power from its hydro-electric plants is transmitted to agricultural and industrial centres, and the complete scheme covers the major portion of the state of Tennessee and in addition sections of four neighbouring states.

On the Mississippi the energy from the Falls of St Anthony was long ago utilised in Minneapolis, and nowadays is employed on a much wider scale for the manufacture of electricity. In the canyon of the Colorado River the massive Boulder Dam stores enormous quantities of water both for the production of electricity and for irrigation. Across the valley of the North Platte River in Nebraska is the still larger Kingsley Dam, opened in 1941. Cities and towns of California obtain electrical power from the streams that flow swiftly down from the Sierra Nevada. But the richest potential resources of water power lie in the north-west, in the area watered by the heavy rains and the deep winter snows of the western slopes of the Cascade Range, and Washington and Oregon, both devoid of coal and oil, are together estimated to hold nearly one-third of the country's total reserves. Here, in Washington, is the Grand Coulee Dam, begun in 1933 and completed in 1941—the greatest enterprise of its kind in the world, far greater even than the Kingsley Dam—*to produce nearly 2 million kilowatts of electricity and* irrigate 1,200,000 acres of land

Canada, too, is extraordinarily well endowed with "white coal" reserves, and although they have not yet been so extensively developed as in the United States. her *per capita* consumption is actually much higher Hydro-electric energy has indeed been uniquely responsible for the industrial progress of the Dominion, is utilised in every leading manufacturing centre, and saves about 45 million tons of coal or twice the domestic output, the vital wood pulp and paper industry is run almost wholly on this form of power Most of the hydro-electric plants in operation are located in the coniferous forest belt of southern Ontario and Quebec, respectively the first and second most important provinces for manufactures In the former the principal installations are at Niagara Falls, which, on the Canadian as well as the United States side of the border, utilise the difference in level of over 300 feet between Lake Erie and Lake Ontario, and there are others on the Ottawa and Nipigon rivers Water power has been particularly developed in Quebec on the Saguenay, St Maurice, Ottawa, and other rivers of the St Lawrence region

On the whole, Europe is fortunately placed for power resources, for countries which are nearly or completely without coal and oil, such as Norway, Sweden, Switzerland, and Italy, have ample water power, while some of those deficient in the latter, such as Great Britain, Germany, and Poland, have coal In Italy the scarcity of mineral fuels has acted as a remarkable incentive to the development of "white coal," and a high proportion of the country's reserves has already been utilised for electrification of sections of the railroads and for manufactures —as, for instance, for the automobile industry of the Turin district, most of the important sites are located round the industrialised region of the Plain of Lombardy, the power being derived from the swiftly flowing streams descending from the southern Alps and the northern Apennines Though her potential wealth is less extensive, of late years France, too, has made great strides in the construction of hydro-electric plants in the French Alps, the Pyrenees, and the Central Plateau, largely on account of the distance of these areas from the main coalfields in the north Likewise, through the excellent use to which the Swiss have applied the energy of their many Alpine torrents, they have become an essentially manufacturing nation, and most of their factories and practically all their railways are run on electricity

Germany's resources, which, though limited, are still superior to those of Great Britain, have also reached an advanced stage of development But the highest *per capita* consumption of water power in the world has been attained in Norway, whose territory contains neither coal nor oil, but—if Soviet Russia be excluded—the richest stores of "white coal' in Europe Hydro-electric energy is, in fact, the bedrock of her important metallurgical and chemical as well as her wood pulp and paper industries, and aluminium, obtained by electric smelting, and nitrogenous fertilisers figure prominently in the country's exports Swedish industries, generally resembling the Norwegian in character, are similarly based on power derived from the rivers, and include the manufacture of electrical machinery, steel is produced with power from the Trollhatten Falls, on the Gota River, and electricity is actually exported from Sweden to Denmark by cables passing under The Sound

In pursuance of the Soviet plan, initiated by Lenin, for the electrification of the entire country, a remarkable number of electric power stations have been erected in the U S S R since the Revolution, utilising whatever local source of power was most readily accessible—petroleum, coal, lignite, peat, or "white coal" Again, as with the mineral fuels, the untapped reserves of water power existing within the Union are enormous, and have been estimated at about one-third of the world total. Her most ambitious hydro-electric project to date was the immense Dnieprostroy Dam across the River Dnieper, and in association with this the gigantic Dnieper Combine and its nest of metallurgical, chemical, and other industries, this plant now requires restoration, for it was wrecked, along with many others in western Russia, during the war. Then the industrial importance of the Leningrad region has been considerably enhanced by installations on the Volkhov and the Svir, while there are others at Yaroslavl and Rybinsk on the Upper Volga, and others near to Tbilisi and Erivan harnessing the energy of the rapid mountain streams of Transcaucasia.

Although estimates of water power are necessarily very approximate, there are known to be tremendous undeveloped reserves outside the areas already enumerated, for instance in the tropical zones of heavy rainfall in South America, Africa, and south-east Asia. Africa is particularly wealthy, for so much of the interior of the continent consists of a lofty tableland and so many of the rivers have rapids and falls in close proximity to the coast, the famous Victoria Falls of Rhodesia alone would probably produce more electrical energy than all the Niagara Falls installations. In South America the rainier areas on the slopes of the Andes and near the edge of the Brazilian plateau are most favoured. But where the population is sparse and industrialisation remote, development is not yet likely, and no doubt North America, Europe, and the U.S.S.R. will continue practically to monopolise the exploitation of the world's water-power resources for a considerable period.

Chapter 11

MORE STOLEN GOODS

BESIDES coal and petroleum, there is a host of other mineral substances which are likewise extracted from the earth according to "robber economy" In general, they are of less vital significance to the human race than many of the products of the animal and vegetable kingdoms, for, whatever the state of the great industries, man must eat, and he must produce a constant supply of foodstuffs of animal and vegetable origin Hence their output usually fluctuates much more widely than does that of the principal foodstuffs, an exception being observed in the case of a country like Soviet Russia, which possesses vast reserves of mineral wealth and yet has only reached an early stage of its industrial development, there, a steady increase in production may be expected for some years to come In the more mature industrial areas, both supply and demand oscillate to the dictates of the trade cycle During a major war, for example, the demand for metals grows enormously, prices rise and, in time, the supply adequately increases, in 1918 the world production of pig-iron was about 65 million tons, but in three years it had slumped to about 35 million tons, to be followed in 1929 by a boom output of nearly 100 million tons, and in 1932 by a slump output of less than 40 million tons, by 1944, after five years of the second World War, the output had reached about 120 million tons Again, in many areas minerals—more especially the precious metals—have been subject to the same sequence of exploitation as some of the early petroleum wells at first, a sudden, phenomenal rise in production, then a transient period with the boom at its peak, succeeded by a steep decline as the field becomes exhausted, many a gold rush has evolved thus, and into the prosaic output curve have been written innumerable stories of high human endeavour and pitiless greed, of success and failure, of fantastic wealth and deep misery

Iron, next to coal the mineral substance on which large-scale industry principally depends, does not occur in the free state in nature, though its ores, in which it exists in chemical combination with one or more other elements, have an extremely wide distribution, only the richest, or the most extensive, or the most accessible deposits, however, are normally considered worthy of exploitation At present the three ores which form the main source of the world's metallic iron are all oxides They are the red hematite, the most important ore mined in the leading United States beds, forming about ninety-five per cent of the country's ore output, magnetite, dark brown to black in colour and the richest of the three in iron content, and the brownish limonite, commonest of the oxides, which often gives a relatively small amount of metallic iron, but is found in such immense deposits that it is commercially valuable

In order to reduce to iron, the ore is smelted in a blast furnace along with a flux, usually limestone, and a fuel, now usually coke or coal, but small quantities of the purest iron are still produced, for example in Sweden, by using charcoal obtained from the forests in place of coke Generally speaking, the high cost of fuel transport causes the iron-producing centres to be located on the coalfields, notable exceptions to this being the American iron towns on Lake Erie, where iron ore from the west meets coal from the east, and the Donbas—Krivoi-Rog and Ural-Kuznetsk areas of Soviet Russia, where the ores are smelted both on the coalfields and on the iron beds Sometimes countries whose deposits are mainly of low-grade quality import purer ores for certain industries: Great Britain purchases Swedish iron ore, for instance, for cutlery manufacture From the blast furnace the molten metal is run into moulds, the solidified product, known as "pig-iron," or when fashioned into usable articles cast iron, is extremely brittle on account of the high content of carbon, and often other impurities such as phosphorus and sulphur "Wrought iron," which is much tougher, but still not tough enough for machinery and similar products, is obtained from the pig-iron by "puddling," while ordinary steel, hard and flexible as well as tough, is manufactured from the latter by the Bessemer or open-hearth process with the addition of a percentage of manganese Steels of better quality are produced from wrought iron by introducing carbon, and special steels by adding a proportion of such metals as nickel or chromium

No country better illustrates the fact that nations rich in mineral fuels and in the chief metallic ores possess the key to industrial supremacy than the United States, for in addition to her leadership in coal and petroleum, she mines about one-third of the world's iron ores Over eighty per cent of this output is produced in the Lake Superior region, where the ores are extracted in the main from the long, low lines of hills known as ranges, the more important of the two sections being situated just west of the lake in Minnesota, and comprising the Mesabi, the youngest and richest deposit, Vermilion, and Cuyuna Ranges, and the other just south of the lake in Michigan, consisting of the Gogebic, Marquette, and Menominee Ranges Against the disadvantage of the distance of the hematite beds from the coalfields is offset their extraordinary abundance, the ease with which they can be exploited, and the comparatively low cost of haulage by the Great Lakes waterway and the railroad A considerable proportion of the eastbound traffic on the Lakes, in fact, consists of the large, flat-decked ore boats steaming from Lake Superior to Lake Erie, there to discharge their cargo to the Cleveland iron and steel district or to trains destined for the Pittsburgh neighbourhood—trains which return laden with Pennsylvania coal, a smaller number of the boats turn down Lake Michigan and unload in the Chicago area, the iron being manufactured there into agricultural implements for the farmers of the Corn Belt

Another iron-ore region, of special importance to the south-east, lies at the southern end of the Appalachian coalfield in northern Alabama, and again mainly produces hematite, in addition to a considerable quantity of limonite With a generous store of good coking coal and limestone in the neighbourhood and a supply of cheap labour, these deposits have assumed first-rate significance and have contributed largely to the rapid growth of the iron town of Birmingham Smaller quantities of ore are also mined in Pennsylvania and New York, principally magnetite, and in some of the Rocky Mountain states, and are of value in supplying local industries Besides her own vast output, the United States imports other ores, chiefly of high-grade types, from Chile, Cuba, and elsewhere

A striking fact about the other leading industrial nations is that, apart from France and the U S S.R , their iron and steel industries depend largely upon supplies of foreign ores, and to a far greater extent than does the United States By the terms of the peace settlement to the first World War, Germany yielded to France the Lorraine field, the most valuable in Europe, which cost her about four-fifths of her ore output This caused the latter to fall well below the British, and still farther below the French Yet the effect on her heavy industries was much less serious than might have been expected, for considerable supplies were still available in western Germany, as well as in nearby Lorraine, ores from overseas could be transported at comparatively cheap rates via the inland waterways, excellent coking coal was still at hand in the Ruhr, and long before the second World War German iron and steel production had forged well ahead both of the British and the French In addition to her purchases from Lorraine, Germany has also imported iron ores heavily from Sweden and Spain Her chief domestic source, the Siegerland deposits, lies conveniently close to the blast furnaces and steel mills of the Ruhr, in the valley of the River Sieg, a small tributary of the Rhine, extraction of the ores is expensive, but they have a fairly high iron content and are rich in manganese Another smaller field is situated at Peine, near Hanover, and a third in Upper Silesia—which, shared with Poland since World War I, it now appears as if Germany may have to relinquish entirely to her neighbour

To a great extent the British iron and steel industries were founded on deposits existing in the coalfields, but this connection between fuel and ore has largely died out, and there has been an increasing dependence on imported ores Supplies from the Cleveland field of the North Riding, which feeds the blast furnaces of the Middlesbrough area, and those of Lincolnshire and Northamptonshire are still considerable, but they are low in iron content, so that the ores purchased from abroad, representing about one-third of the total, are mainly of higher grades Red hematites of richer quality are mined in north Lancashire and Cumberland, and have supplied the iron-smelting industry of the Barrow neighbourhood, these, however, are also showing a decline in output, and the iron towns, like those of Lanarkshire in southern Scotland, are relying more and more upon ores imported from Spain Likewise, iron smelting in South Wales for the important tinplate industry now runs almost entirely on ores brought from northern Spain and Algeria, while the country imports, too, from France, and smaller quantities of magnetite of first-rate quality from Sweden

In the massive Lorraine deposits, in the basin of the River Moselle, France owns the richest field of iron ores in Europe, and one that is second only in world importance to the Lake Superior field of the United

States, some supplies are furnished by other districts, but over ninety-five per cent of the national output comes from Lorraine From the end of the Franco-Prussian War in 1870 till the close of the first World War this province had been lost to France, and with it the wealthier section of the field—in the Metz-Thionville area, her remaining share comprised the portions around Briey and Longwy, near to Luxembourg, and farther south around Nancy On the return of Lorraine, French production of iron ores increased tremendously, but from the standpoint of her iron and steel industry there was still the problem of an adequate fuel supply—solved for fifteen years by her working of the Saar coalfield Geographically, the close proximity of the Saar basin placed the whole region in a far more favourable situation than the Lake Superior–Pennsylvania areas of North America, but the fundamental difference after 1935, when the Saar collieries were restored to Germany, was that the link between ore and fuel spanned a political frontier On that account the French made strenuous efforts to render themselves less dependent on German fuel by developing to the full their own northern coalfields, and by strengthening trade relations with Belgian and Dutch coal interests Fuel-laden trains from Germany still crossed the frontier, however, including some carrying coke from the Ruhr basin which returned with ore for the German iron and steel industry Apart from political considerations, earlier difficulties in exploitation of the Lorraine ores had had to be surmounted owing to their low content of iron and the relatively high proportion of phosphorus, and until the Thomas process of 1879 enabled the injurious phosphorus to be removed in the conversion of pig-iron to steel, development was only on a small scale On the other hand, the ores which consist in the main of hematite and limonite, can be mined cheaply and smelted easily, and are generally so rich in lime as not to require the addition of flux in the blast furnace

In addition to the large quantities consumed near to the deposits and on the northern French coalfield, a surplus amounting to nearly one-half of the total output is exported, chiefly to Belgium and Luxembourg, and also to Germany, Holland, and Great Britain Just across the frontier, in southern Luxembourg, is an important extension of the Lorraine field, where the ores are also, in part, smelted locally, in part exported. Minor French deposits are exploited, too, near to Caen, in Normandy, and in the eastern Pyrenees, but the Lorraine field alone will assure France of a long leadership in iron-ore production, at least among the industrial nations of western and central Europe

To Spain and Sweden, both rich in high-grade iron ores, the lack of a satisfactory coal supply has been far more serious than in the case of France, and their development of a large-scale iron and steel industry has thus been prevented Most of the Spanish output comes from the slopes of the Cantabrian Mountains, along the northern coast, and the surplus is shipped chiefly to Great Britain and Germany, the nearness of the deposits to the seaboard and the nearness of the British and German iron and steel industries to their seaboards ensure transportation almost completely by water, and are of economic advantage to both producer and consumer Outside the Basque provinces, Spain has extensive deposits, too, along the flanks of the Sierra Nevada and the Sierra Morena in the south, worked principally in the provinces of Murcia, Almeria, and Málaga, most of the ores having a high iron and a relatively low phosphorus content Although her most productive zone, in the north, has been worked for an extremely long period, the country's iron resources are by no means yet fully developed, and an abundance of lower-grade ores still awaits exploitation

More enterprise in the utilisation of her resources has been shown by Sweden, whose heavy imports of coal and coke denote the increasing domestic manufacture of iron and steel goods Her output of iron ores has been growing steadily during recent years, more particularly from the northernmost fields of Swedish Lapland, beyond the Arctic Circle There, in the districts of Kirunavara, which alone holds over half of the country's ferriferous wealth, and Gellivara lie the most extensive reserves of magnetite, easily worked and extraordinarily rich in iron, in Europe Much of the mineral, highly esteemed among the industrial countries of western and central Europe for its exceptional quality, is transported by the railroad running alongside them from Luleå, on the Gulf of Bothnia, to the ice-free Norwegian port of Narvik, and is thence exported Other deposits, exploited from an earlier date but now giving much smaller yields, are located in central Sweden, mainly in the region of the River Dal, similarly rich in iron and also low in phosphorus content, most of these ores are consumed by Swedish smelters Chiefly by reason of her lavish beds of magnetite, Sweden's natural wealth is truly said to be vested in her forests and mines, as her neighbour's, Norway's, is in her forests and fisheries, and formerly a stimulus to the lumbering and mining industries was mutually derived from the utilisation of wood charcoal as fuel for the blast furnaces

From what has already been said of the industrialisation of Soviet Russia, it will have been deduced that that country has become a dominant figure among the world consumers of iron ores Even in Tsarist days encouragement was given to the exploitation of the few known domestic fields, and Russia had risen to sixth place in world output But, after the Revolution, geological surveys revealed gigantic extensions of the old, and huge entirely new, deposits, and by increased working of these Soviet Russia, in less than two decades, joined the United States and France as one of the three nations which, in production of iron ores, easily outstrip the rest of the world Hitherto, the most important beds have always been those of the Krivoi Rog area, in the Ukraine, which were lately discovered to form only part of a huge basin lying to the west of the Donets coalfield Despite their distance from the main centres of population, in pre-Soviet days the proximity of good coking coal ensured the absolute supremacy of the south in the iron and steel industries, but, whereas the latter were concentrated on the Donets basin and the ore trains used to return empty, they later carried fuel back to the blast furnaces constructed at Krivoi Rog Among the older beds, a much less valuable centre lies in the Tula coal-basin south of Moscow

Of the mines opened in more recent years, which are fast causing the Ukraine to lose its entire superiority in iron production, the group located in the southern Ural Mountains has been by far the most significant—and the enormous body of rich ore, easily and cheaply extracted, known as Magnet Mountain, the most remarkable single unit In the south, freight steamers crossing the Sea of Azov exchange iron ore mined at Kerch with Donets coal shipped from Mariupol, smelting taking place at both towns—providing a small-scale replica of the Krivoi Rog—Donets and the Ural-Kuznetsk combines But under the Soviet regime disclosures of new wealth in iron have been made in some of the farthest-flung corners of the Union· near to the coast of the Kola Peninsula in the extreme north, served by the Murmansk railroad, and on the slopes of the Caucasus Mountains in the extreme south, together with a large mass of magnetic ore at Kursk, and other deposits at various points along the southern border of Asiatic Russia as far as the Pacific

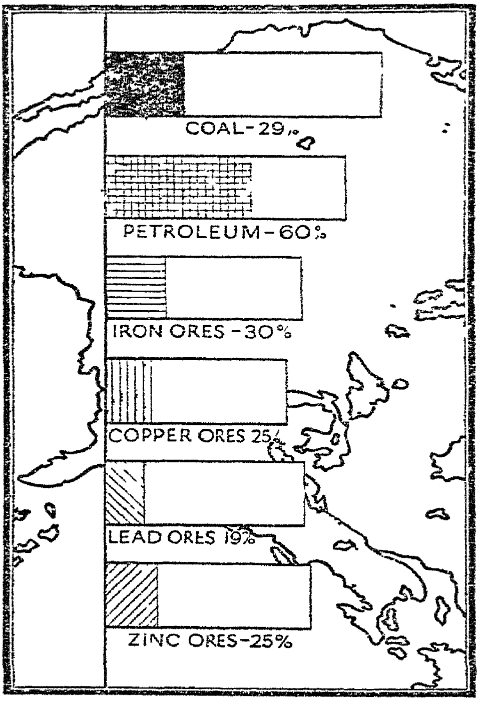
In spite of the vast increase in world consumption of iron, there is no fear of scarcity for many centuries Apart from the recently discovered deposits of Soviet Russia, many areas have only just begun to operate, while others are believed to hold extensive reserves so far untouched Japanese industries have drawn both upon their own resources and also upon those of China, Korea, and Manchuria, which now, no doubt, will be utilised for the development of Chinese industries, and Malaya is one of the leading minor producers, but on the basis of actual output and of known reserves, India is the most fortunately placed of Asiatic countries In Africa, Algeria, Morocco, and Tunis have entered the field as exporters, and the Union of South Africa and Sierra Leone now have a small output of iron ore, in South America, Chile is exporting to the United States, and considerable beds are known to exist in eastern Brazil, while Australia, too, has quite important though limited stores of the mineral

U S SUPREMACY

One of the first metals to be utilised by man, and in modern times the next in significance to iron, was copper That malleability which enabled our distant ancestors to hammer it out into pots and pans is of equal value to-day Moreover, it does not rust, while the ease with which it fuses with other metals has been commemorated by the naming of the "Bronze Age," the age when men fashioned their weapons and tools from this alloy of copper and tin, tougher and more durable than the pure metal brass is an equally useful alloy, being compounded of copper and zinc But its most vital property now is its high electrical conductivity, which, coupled with its ductility, facilitating the manufacture of wires of the finest gauge, render it indispensable to all industries associated with the generation and transmission of electricity Its ores contain a much smaller proportion of the metal than do iron ores in the United States, for instance, they have a content varying between one per cent and eight per cent, usually nearer the lower level, while the latter have on the average around fifty per cent of the metal, the ores are first smelted to ninety-eight or ninety-nine per cent metal, and then are refined to the almost 100% purity demanded by the electrical industries

Once more, it is the United States that holds the leadership in production. Although her yield fell in two decades from over half the world output to about one-quarter, chiefly owing to the rapid development of copper-mining in Northern Rhodesia and the Belgian Congo, she is still pre-eminent. Moreover, war needs caused her output to be nearly doubled between 1938 and 1943, during the same period her production of iron ore had been more than trebled! And her capital interests are so prominent in Chile and Canada, respectively second and third among world producers, as well as being represented in the African mines, that she controls nearly three-quarters of the world's metal. She is the one major power, in fact, able to satisfy home needs from home deposits. Great Britain, with no copper ores, imports from Northern Rhodesia and Canada, and metallic copper from Chile and the United States, France is in a similar position, and other industrial nations, Germany, Soviet Russia, and Japan, must also fulfil their requirements by purchasing from abroad.

Besides absorbing the products of their own mines, the American refineries import from Canada, Chile, and other ore-producing areas, and the country has a substantial export trade in the metal. Her richest ore deposits lie in south-eastern Arizona, a region well-enough stocked to retain supremacy for many years, and other outstanding centres are located in Utah, just south-west of Salt Lake City, and the Butte district of Montana, in the heart of the Rockies. Production of copper has increased quickly in Chile, and the metal has now displaced nitrate of soda as the country's chief export, it is mined in a number of districts along the flanks of the Andes, the principal being Chuquicamata, in the north, served by a branch of the Antofagasta-La Paz railroad. There are large reserves, the ores can be easily extracted and refined, and the mines are conveniently close to the coast, whence the raw material can be cheaply transported by sea to the main markets. That advantage is not shared by the mines of the Katanga district of the southern Belgian Congo and the adjoining region of Northern Rhodesia, deep in the African interior As compensation, however, their yields are comparatively pure, being over three times as rich as the average American ores, and labour is cheap, while in



In production of these six leading minerals the United States is first among the nations Her proportion of world output is shown, based on the last "normal" year, 1938, except for iron ores, for which a more representative year, 1939, was chosen

1931 they were brought nearly 3,000 miles nearer by transportation route to Europe by the opening of the railroad to Benguella, on the coast of Angola British and Belgian interests are in command here, and in view of the prodigal reserves will continue to have a weighty influence on international trade Canadian copper is mined principally in the Sudbury district of Ontario and in British Columbia

In the production of three other important non-ferrous metals—lead, zinc, and aluminium—the United States also holds first place Of these lead is especially useful on account of its malleability and its resistance both to corrosion and to the action of certain acids which affect other metals, it is, therefore, made into conduits for cables and wires, gas pipes and water pipes. the linings of vessels employed in the manufacture of sulphuric acid, and the plates of accumulators, and is a commodity essential to modern industry None of the industrial nations of western and central Europe, nor Japan, is able to produce sufficient ore for her own requirements, and Great Britain, the greatest importer of all, purchases from Australia and Canada—both always among the leading four producers—and Burma. Nowadays the metal is received in the form of pig lead or sheet lead, for the ores are usually smelted in the vicinity of the mines Almost the entire American output is consumed at home, and a great deal of the Mexican production is also absorbed Missouri is the leading lead state, the mines being situated in the south-east and in the south-west—the Ozark Mountains, the latter area, extending into adjacent Oklahoma and Kansas, and being followed by Idaho and Utah

Second place in world output has been occupied for some years by Australia, whose mines at Broken Hill, New South Wales, form probably the richest combined silver-lead area in the world, and have given rise to a thriving township of over 30,000 people in an otherwise uninhabited wilderness Practically all the ore is dispatched by railroad to Port Pirie, in South Australia, where large lead-smelting works are operating Reserves are considerable, and further deposits are worked in Queensland and Tasmania, but the one major disadvantage to the Australian lead-mining industry is its remoteness from the main industrial centres. During the past thirty years the production of the lead mines of northern Mexico has fluctuated very widely, chiefly because of political unrest, but it is now not far behind that of Australia. Indeed, the metal is the country's third leading export, after petroleum and silver, the industry is controlled in the main by American capital, and most of the export trade is with the United States, the remainder with the European continent. The great majority of the Canadian output comes from British Columbia, where the availability of cheap power facilitates both mining and smelting, and enables the Dominion to take third or fourth place among the world's major producers.

Galena, a compound of lead with sulphur, is the commonest ore, is often found associated with zinc blende (a sulphide of zinc), and from some mines the three metals, lead, zinc, and silver, are all produced. Thus, many of the world's chief zinc-producing regions are those which are well known also for their lead. One of the principal industrial uses of this metal is in the process known as galvanising, which consists in coating sheets of iron or steel with a thin layer of zinc, as the latter is unaffected by moisture, the resulting product does not rust, and may be employed, for instance, as roofing material. Another important use is in the manufacture of brass. Much of the zinc output of the United States, which represents nearly one-third of the world total, comes from the famous lead-producing Joplin district of south-west Missouri, Oklahoma, and Kansas. In many of the Rocky Mountain states, led by Montana and Utah, the metal is often mined in the form of complex ores containing lead, silver, gold, and manganese as well as zinc, and the state of New Jersey is exceptional in having a deposit of zinc ores practically free from lead or other metal.

Belgium follows the United States in production of metallic zinc, but almost all the ores which are refined have to be imported, mainly from Australia and Mexico. Germany had an appreciable output of zinc ores, mainly from the Upper Silesian deposits, at the end of the first World War many of the mines as well as smelting and refining plant were relinquished to Poland, and, during recent years, ores have had to be imported in order to maintain the country's high position among metallic-zinc producers But Great Britain, again, is the leading importer, making heavy purchases of zinc and zinc ores from Australia and Canada

Aluminium provides a striking illustration of a metal being for long well known, but too costly to extract on a large scale from its ores, then, on the invention of a relatively cheap smelting process, rising rapidly to industrial prominence In many respects its properties are unique Besides being tough, ductile, a good conductor of heat and electricity, and resistant to atmospheric and chemical action, it is exceptionally light, and when fused with certain other metals produces alloys comparable for durability with high-quality steel During the past few decades the demand from the realms of transportation has increased enormously, especially to satisfy the needs of aviation, and by the nations which have been most interested in the development of the aircraft industry—the United States, Great Britain, Germany, France, Italy, and the U S S R —it has been regarded as a key metal Much of the output has also gone into the manufacture of automobiles and railway rolling-stock, cooking utensils and other household appliances, and electric cables, and at the commencement of the second World War, when most of the metal was required for military planes and other products of the armament industries, a host of new uses for it had been found for factory, office, and home

Although it occurs so extensively in the earth's crust in such common substances as clay and feldspars, aluminium is obtained from bauxite, a hydrated oxide of the metal, which is mined in comparatively few areas, formerly three nations, France, the United States, and Hungary, contributed the major part of the world output, but in the last ten years, and especially during the war, a rapid expansion of production brought British and Dutch Guiana into the front rank The ore contains many impurities, and is extremely bulky in proportion to its value Hence the first stage in its conversion to the metal, the production of the oxide, alumina, is carried out either near to the mines or at a point whence it can be transported cheaply by water In the United States, for instance, the great alumina-producing centre is East St Louis, Illinois, suitably placed for reception of the domestic ores, eighty–ninety per cent of which come from the state of Arkansas, and of the imported bauxite, which is conveyed by ocean steamer to New Orleans, and thence by river barge up the Mississippi Then the next stage, the reduction of alumina to aluminium, is likewise strictly controlled by geographical location for this process must be performed at the high temperatures of the electric furnace, demands a heavy current, and is therefore commercially practicable only where water power is available Thus the metal is produced in large quantities in such localities as Niagara Falls in the United States, and in the French Alps, and also in such countries as Canada, Norway, and Switzerland, which have no bauxite but are well endowed with hydro-electric plant Cryolite, another aluminium ore which is essential to the smelting but does not actually yield the metal, is mined exclusively on the west coast of Greenland

France has consistently had a heavy production of bauxite and a considerable surplus for export, principally to the United States and Great Britain, most of the substantial output of Hungary, Yugoslavia, and Italy was sold to Germany, who, in the years just prior to World War II, had actually overhauled the United States in manufacture of the pure metal During the war, however, both American and Canadian production was raised by almost 500 per cent and gave the United Nations an overwhelming superiority in aluminium Until recently, the United States stood alone among the nations in having a heavy production of both ore and metal, though to maintain her dominating position in output of aluminium she was obliged to import ores, too, from Europe and from British and Dutch Guiana But Soviet Russia, now a leading aluminium producer, is in a similar position With the vigorous exploitation of her own bauxite mines and the construction of smelting works near to Leningrad and elsewhere, her programme seems to aim at virtual self-sufficiency in ore and metal—for aluminium, as for zinc and lead

Perhaps the most remarkable development in Soviet Russia's non-ferrous metal industries has been in the production of gold Her claim to hold the largest reserves in the world bluntly contradicts the estimates made by some authorities in the early 'thirties that by 1950 the metal would have become extremely scarce and world production would have sunk to one-fifth of its former level That eventuality might have presented mankind with a serious problem, for, as the international standard of currency, gold may be said, without elaborating too romantically, to have swayed the destinies of nations, that mysteriously significant expression, "the gold standard," has become a byword to the modern age Usually the metal is found in the free state, either in reefs, in general mainly of quartz, or in alluvial deposits; in the latter case, it has been washed out of gold-bearing rocks and carried away by streams, and occurs in the form of "nuggets" or dust, and unless the deposits are very extensive the area is soon exhausted—hence the transitory nature of many of the famous "gold rushes" of the past

For many years, by far the richest gold deposits have been the reefs or bankets of the Witwatersrand region of the Transvaal, in the Union of South Africa, the source of one-third to one-half of the world's supply This district, familiarly known as the Rand, comprises a ridge about sixty miles long, running east to west through Johannesburg, and containing the gold-bearing bankets, each a few feet in thickness Within these beds the metal is secreted in such minute particles as to be practically invisible to the naked eye, and, in fact, for a long time lay there undetected Thus the rock has first to be crushed by powerful, expensive rolling and stamping machinery before the gold can be chemically extracted—a factor which has made exploitation on the Rand, in contrast to alluvial digging, a capitalist's rather than a poor man's enterprise, the enormous dumps of white sand dotted around Johannesburg are the waste products of this preliminary operation Production is facilitated by a supply of cheap coal in the vicinity, and now—although at one time Chinese coolies had to be imported—of cheap native labour In many mines the metal is already being extracted at depths of well over a mile below the surface, but elsewhere the reefs still await exploitation, and at present there are no fears of the region soon becoming exhausted From 172,000 oz in 1888 the output rose in twenty-five years to over 8 million oz, and, in recent years, has been maintained fairly steadily at 10 to 11 million oz, at the same time, the value of the gold in the world markets has increased considerably, and it has lately represented about two-thirds of that of the total exports from the Union

Before the Revolution only a minor producer, the U S S R has achieved a gold output amounting to nearly half that of the Transvaal, and has taken second place in world production Hitherto, her most productive deposits have been in the southern Ural Mountains and in the basin of the Lena River, but other beds exist in the Altai Mountains and in the Far East Among the leading industrial nations the only other to possess important gold mines is the United States, whose yields have fallen considerably but have still enabled her to occupy fourth place among world producers Gold is widely scattered throughout the entire length of the Rocky Mountain chain, from Alaska to Mexico, the most prominent areas recently being California and Alaska, in these western states were enacted many famous gold rushes, and, as so often on the oilfields, the story was usually one of heavy production, rapid exhaustion, and then the search for a new El Dorado This was notably so on the alluvial beds, such as the one at Dawson City, Yukon, which caused the Klondyke gold rush—most famous of all—in 1896 Nowadays Canada's production, which is usually just ahead of the United States', is derived largely from the mines of Ontario, and the Yukon has sunk to insignificance, reserves in Ontario appear to be considerable, and there are numerous other deposits in various parts of the Dominion Australia, once the Mecca of gold prospectors, has had a much more chequered history, and is now well behind Canada in output After the early gold rushes in Victoria, which first drew large numbers of white settlers to Australia, there was a steady decline in yields, and many of the miners turned to farming for a livelihood, the discovery of the Kalgoorlie and Coolgardie and other mines in Western Australia—now the leading state—brought a temporary revival, but from 1903 to 1930 there was again a substantial fall in production Then followed another partial restoration of the gold-mining industry, reaching its peak in 1939, brought about by the enhanced value of the metal, but there is small chance of Australia entering the lists anew as a major producer

Because the majority of the world's silver is obtained as a by-product from lead, zinc, copper, or other metallic ores, while the production of these base metals has immensely increased, the price of silver has fallen and its use as a standard of currency vanished, there is still a considerable demand for the metal, however, for coinage and jewellery, and in electro-plating A remarkable feature of world production is the domination of the North American countries, Mexico, United States, and Canada, which are first, second, and third respectively, Peru being usually fourth It was the existence of rich stores of the precious metals in the Aztec domain that first lured the Spaniards to the New World, and silver is still second among Mexican exports, her principal mines, which are unusual in that most of them yield silver ores alone, are located near to Mexico City, the capital, on the high plateau extending from the Rocky Mountains In contrast, silver is mainly extracted in the United States in association with lead or copper, and, as with gold, comes from the Rocky Mountains, the leading states being Idaho, Utah, Montana, and Arizona Apart from their own heavy output, United States interests control most of the Mexican and Peruvian and many of the Canadian mines Most of the Canadian silver is obtained, along with a variety of other metals, in Ontario and British Columbia, while the Australian is extracted principally from the lead-zinc mines of Broken Hill, New South Wales

Of those commoner metals that are indispensable to modern industry there is one alone, tin, in which the United States is seriously deficient, yet is the heaviest consumer Again, most of the world output is concentrated in a single region, in this case south-east Asia—a situation reminiscent of that of plantation rubber, the main producing countries there being Malaya and the Dutch East Indies, and, to a lesser degree, Siam and China Its most widely occurring ore is the oxide, cassiterite, and it is mined either from lodes, known as mine-tin, or from alluvial deposits, known as stream-tin, the latter, being nearer to the surface, are more easily worked, and many of the Malayan deposits are of this type—but they are also more likely to be exhausted soon. Despite the cheapness of tinplate, in the shape of the ubiquitous tin can, tin is a relatively rare metal, and as with gold and silver, a quite small but steady world output has been maintained—recently between 100,000 and 200,000 tons per year, compared, for example, with 1½ to 2 million tons of zinc

Its greatest use is in the manufacture of tinplate, which consists of sheets of steel covered with a thin layer of the metal, about half a pound of pure tin being sufficient to produce 100 square feet It is put to this purpose on account of its resistance to rust and corrosion, and the immensely increased production of tinplate for cans, used as food containers, is due to the fact that the coating of tin protects the steel from chemical action by acids or by moisture in the food, and so preserves the food itself Terneplate is prepared in a similar manner, but from a tin-lead alloy, and is employed in roofing and in automobile petrol tanks, while other important uses for the metal are the manufacture of the alloys commonly known as solder and bronze

Tin is generally exported either in the metallic state or as a concentrate ready for the refinery Most of the ore mined in the Malayan peninsula, the richest tin area in the world, is reduced to the metal in the smelters of Singapore before being shipped to Europe or North America, her tin mines and rubber plantations, yielding the two most valuable exports, have been chiefly responsible for Malayan prosperity Farther south the metal appears again on the Dutch islands of Banka and Billiton, the ores being smelted mainly in Banka or in Malaya (which also absorbs most of the much smaller Siamese output), the remainder being exported to Holland Bolivia is the third of the world's major producers, and in output is usually just behind the Dutch East Indies The mines are situated on the lofty plateau of the Andes, over 12,000 feet above sea level, and the concentrated ores, which comprise the country's principal export, have to be shipped to Great Britain for refining via the port of Mollendo, in Peru, or Arica—the nearest point by rail to the coast—or Antofagasta, in Chile The only other countries with an appreciable output are Nigeria, with alluvial deposits on the Bauchi plateau, in the interior, and the Belgian Congo Through their ownership of most of the smelters, the production of the world's tin is very largely controlled by British and Dutch interests, a situation which the American consumers sought to correct by planning the erection of their own smelters, this move, however, was countered by the British imposition of a heavy export tax on all ores from British possessions not transported to British foundries. By agreement among all the leading producers, the world production and export of tin has been strictly regulated during recent years, and, incidentally, the high price of tin has been maintained—so that several uneconomic mines, especially in Bolivia and Nigeria, have been able to continue in operation.

A number of minor metals are also indispensable to industry, chiefly because of their use in the manufacture of various steels, and a feature of their production is again the supremacy exercised by certain areas. One-third to one-half of the world output of manganese, for instance, is mined in Soviet Russia, chiefly in the Ukraine, the Caucasus, and the southern Urals, and most of this is consumed by the country's expanding iron and steel industry. India and the Gold Coast are major producers whose manganese is almost entirely exported, the main purchasers being those iron- and steel-producing nations, including the United States, that are deficient in the metal. Over eighty per cent of the world's nickel, in special demand for armament steels, comes from Canada, principally from the nickel-copper deposits of Sudbury, Ontario; from 1914 to 1939 the output was multiplied four times—in the same period as Canadian production of copper increased seven times, of lead eleven times, of zinc seventeen times, and of gold six times! Nickel is also extracted in the French island of New Caledonia, while the Russian output from the southern Urals is increasing. Chromium is utilised extensively for hardening steels and in chromium-plating; Turkey normally leads in production of the ores, while the U.S.S.R. is well able to meet domestic requirements. Southern Rhodesia and the Union of South Africa rival Turkey in the export trade, the heaviest importer again being the United States. Soviet Russia is alone among the industrial nations, too, in satisfying home demands for mercury, a metal which is widely employed in scientific instruments, as well as being used in the extraction of gold and silver and in the armament industry for detonators But one of the main sources of world supply is still the famous Spanish mines of Almaden, which were operating in the days of the Roman Empire, Italy is usually first or second in production, and the United States, with mines in California, is ahead of Soviet Russia

Certain non-metallic minerals, too, are of major importance to industry, and one, common salt, forms an essential constituent in the diet of both men and animals So necessary is it as human food that among some primitive tribes scarcity has caused it to be used as an article of currency In largely vegetarian countries, where the majority of the population do not consume it indirectly in animal foodstuffs, its value is enhanced, and in the case of India, for example, the deficiency of supply is rendered more acute locally by excessive rainfall, and large quantities have to be imported Sometimes the inescapable need of the mineral has brought about the imposition of a salt-tax as a means of obtaining revenue from subject races whose poverty made a property-tax impracticable, India, again, provides the classic instance of such procedure, and state monopoly of salt works and the prohibition of salt collection and production in various states formed part of the general plan In the main, however, it is not a commodity that enters international trade in substantial amounts it is quite widely distributed about the world, both in the oceans and seas and inland, and is usually consumed more or less where it is produced

Three different sources are used—rock salt mines, from which it is extracted either in the solid state or by pumping water into the beds and withdrawing the resultant brine, inland salt lakes and salt wells or springs, and sea water Besides its use as a food, common salt is heavily consumed by the chemical industry for the manufacture of alkalis, as a food preservative—especially meats, and in butter-making—and Great Britain, with resources in Cheshire and elsewhere, is said to have the highest *per capita* consumption In the United States, the world's leading producer, it is obtained as brine and rock salt, chiefly in Michigan, New York, and Ohio, along the Californian coast sea water is evaporated, and in Utah the water of the Great Salt Lake China has considerable resources in the province of Szechwan, Soviet Russia's output comes mainly from brine lakes in the northern Caspian area and the Crimea, while Germany's richest deposit is the remarkably pure rock salt associated with the Stassfurt potash beds, in Saxony India, besides importing salt, is a major producer, her supplies being obtained as evaporated sea water around the coasts and as rock salt, mined in the Punjab

Another mineral that occurs extensively in nature in small quantities, sulphur, is produced on the commercial scale, however, in very few areas, its many industrial uses include the manufacture of sulphuric acid, matches, explosives, and insecticides, and the vulcanisation of rubber For long the volcanic areas of Sicily were the chief source of supply, and the output of that island, from which it is an important export, has been maintained at a steady level But about thirty years ago sulphur deposits located near the coast of the Gulf of Mexico, first in Louisiana and later to an even greater extent in Texas, leaped into prominence, quickly outstripped all other producers, and now yield about four-fifths of the world production, reserves are ample, and there is small chance of Sicily regaining markets from the United States

Undoubtedly one of the landmarks in world agricultural and scientific progress was the utilisation of another group of minerals to renew the fertility of the soil—a step which did much to dispel the fears commonly expressed a few centuries ago that, with increasing exhaustion of the soil and a rising population, a large proportion of the human race would ultimately face starvation, a step which revealed new potentialities of natural wealth, and offered one more convincing piece of evidence that ours could be a world of plenty These mineral fertilisers are designed to replace the plant foods, principally represented by the chemical elements nitrogen, potassium, and phosphorus, which continuous crop growing has removed from the soil, and they are, therefore, most heavily consumed in areas where cultivation has been long and intensively practised —such as Holland, Belgium, Germany, Denmark, and the eastern United States

One of the chief sources of nitrogen is nitrate of soda, often known as Chile saltpetre, which occurs in massive deposits in the high, practically rainless Atacama Desert of northern Chile When the "caliche" containing the nitrate has been broken up and extracted, it is conveyed by railroad to a refinery, where the mineral is removed by leaching and then evaporation, iodine being obtained in the process as a by-product For long Chile virtually held the monopoly of the world's nitrate supplies, but her position has been considerably weakened, mainly by severe competition from artificial fertilisers produced synthetically by the fixation of atmospheric nitrogen, and from nearly nine-tenths of the total output towards the end of the last century, her contribution has fallen recently to below one-tenth, ironically, the reduction in demand came after the discovery of vast new fields had quashed the suggestion of approaching exhaustion Though still one of the two bulwarks of national prosperity, nitrates have thus yielded first place in Chile's overseas trade to copper, her foremost customer has been the United States, followed by Germany, Great Britain, other northern European countries, and Egypt, where agriculture is intensive Although improved methods of production have assisted the Chilean nitrate industry in its struggle for markets, and although there will probably be a temporary revival while European nitrogen-fixing plant destroyed during the war is being restored, the generally rising output of artificial fertilisers presages a still further loss of ground in the long run.

When the potash salts of the famous Stassfurt beds in Germany were first mined, they were regarded as useless waste material and were thrown away, now they are the world's chief source of one of the three most important mineral fertilisers, as well as providing various chemical salts indispensable to the manufacture of medicines, soaps, paints, dyes, explosives, glass, and other products. Most of the potash is normally consumed within Germany, both as fertiliser by the farmers and by the numerous chemical works which have arisen in the Stassfurt district, the exports being mainly destined for the United States and the countries of north-west Europe. These importers also purchase potash from the less extensive but extremely valuable French deposits near Mülhouse, in Alsace. Together the German and French output represents over ninety per cent of the world total, and, in spite of the increasing output of the United States and Soviet Russia, their enormous extent, estimated at many thousands of square miles, seems to indicate that they will retain their supremacy.

Our third group of fertilisers, the phosphates, take part in international trade to a greater extent than potash, though this distinction will tend to disappear as the industrial nations consume as substitute more basic slag—a by-product obtained in the production of iron from phosphoric ores. Hitherto the United States has been the heaviest producer, in the main from extensive beds in western Florida, and has exported a considerable proportion of her output to Europe and to Japan. An even greater amount is shipped from the three French possessions of Tunis, French Morocco, and Algeria, chiefly to southern and western Europe. But the U.S.S.R., independent of foreign supplies both of phosphates and potash, is not far behind the United States in phosphate production, and with the exploitation of enormous new deposits in the Kola peninsula may well outstrip that country and French North Africa.

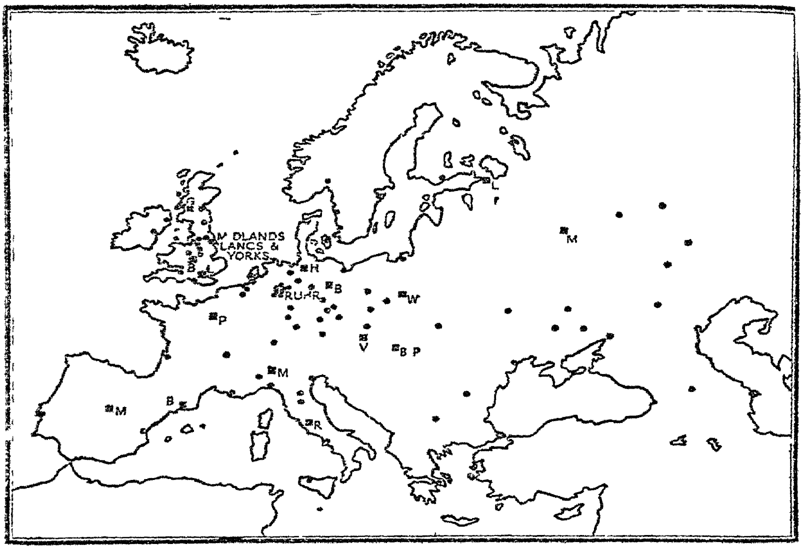
Chapter 12

WORKSHOPS OF THE WORLD

UP to this point we have enumerated all the principal items of the world's wealth, we have located the regions where they are found, and, for the most part, where they are sent. But that is not the end of the story. As we have observed from time to time, in their original form many of these natural resources are of little value for providing mankind with food, clothing, shelter, and the thousand-and-one appurtenances of modern life. Fields of golden corn may inspire, but they will not be of the highest material benefit to an already hungry populace until harvesting, milling, and baking have rendered them consumable, a million unshorn sheep on the pastures afford no protection against winter cold, abundance of coal and iron ore is useless to the builder of an all-steel apartment block. These examples of natural wealth, and many others, are, in a sense, frozen assets, and will remain so until thawed into usable goods by manufacturing processes. To gain a complete picture of the world's resources, then, revealing how they are consumed as well as produced, we must discover where the transformation takes place. Very often the manufacturing is carried out at centres far removed from the source of the raw materials, for reasons that are not always apparent. American cotton, for instance, is dispatched across the Atlantic to Lancashire, Australian wool travels half-way across the world to be spun and woven in Yorkshire.

In the early days of the Industrial Revolution, when the cottage handicraft was being replaced by a large-scale, machine-driven industry housed in factories, the latter were dependent upon sources of power, and the workshops of the world frequently grew up on or near to coalfield. It was natural that the coal deposits should be first worked, that industrial areas should arise, in that country which led the world in scientific and engineering skill and was in the forefront of the Industrial Revolution—Great Britain—to be succeeded by other countries of north-west Europe and later by the United States and Japan, all of them situated within the intermediate zone, and thus possessing a climate which stimulated rather than damped the expenditure of human energy—as do more extreme climates—and encouraged their inhabitants in efforts towards material advancement On this account, that part of the zone that we have previously called the cool intermediate region, comprising roughly the north-eastern United States, a broad belt stretching across north-west and central Europe to the south-western U S S R, northern China and Japan, Korea and Manchuria, as well as corresponding areas in the southern hemisphere, is often termed—and well termed—a "region of effort" It may be noted that all the five leading industrial nations, the United States, Great Britain, Germany, France, and Japan, as well as the newly developing industrial nation, Soviet Russia, lie wholly or partially within the region It may be noted, too, that of the world's greatest centres of population, those thirty-five cities having more than a million inhabitants, fifteen are in Europe, either within or only just outside the margin of the cool intermediate zone, while four others are in the north-eastern United States, four in northern China, and four in Japan

In an earlier chapter we found that the original, natural environment of this zone consisted primarily of deciduous forests, for the rainfall is sufficient to support tree growth, and that the woodland was largely cut down to make way for agriculture—to such an extent, that in England and the eastern United States forests have practically become national oddities Then, with the advance of industrialisation, the cornfields and pastures disappeared from considerable areas, and the surface gear of collieries, textile



Of the 35 greatest urban centres, each with over 1,000,000 inhabitants, 15 are in Europe alone, and are shown here by small squares, the round dots indicate centres with 250,000 to 1,000,000 inhabitants The concentration in Great Britain and Germany will be noted

mills, blast furnaces and steelworks, factories and shipyards, and the sprawling agglomerations of workers' dwellings dominated the scene, so that in countries which had no substantial reserves of cultivable land to develop, such as Great Britain, Germany, and Japan, the people were compelled to exist very largely on imported foodstuffs And now let us examine in more detail the nature of the world's leading workshops, their specific functions, the raw materials they consume, the finished articles they produce, and the areas they supply

Two of the greatest manufacturing regions flank the North Atlantic Ocean, being situated in western Europe and the eastern United States, and we may conveniently consider first the older countries of Europe A striking feature of the industrial areas of Great Britain is their proximity to the coalfields, though the use of electrical power is now causing a movement away from the sources of fuel, especially to the south-east of the country, and another the specialisation in certain types of manufacture in certain districts Much of Great Britain's external trade is represented by textiles, and the cotton industry, although considerably reduced from its former glory, is still an important factor in the country's prosperity It provides an excellent example of the localisation of an industry, for the spinning mills and weaving sheds are almost entirely concentrated within that part of Lancashire which lies south of the River Ribble, and a few centres, Glasgow being the chief, in western Scotland Manchester is the dominating centre of the trade, Oldham and Bolton the main spinning towns, Burnley, Blackburn, and Preston the main weaving towns

Lancashire's proud position in earlier days of foremost textile manufacturing region in the world was largely due to a number of geographical and economic causes In the first place, the port of Liverpool, with its commercial associations with the American settlers, was admirably placed for the importation of raw cotton, and likewise for the distribution of cotton goods to all parts of the world—for there are few regions where cotton goods are not consumed, then there was an abundance of power available in the neighbouring coalfield, and the damp climate west of the Pennines is eminently suited to the spinning and weaving, for in a drier atmosphere the thread becomes too brittle and breaks readily In the heyday of the British cotton industry Lancashire held about seventy per cent of the world export trade in cotton cloth, and approximately four-fifths of her cotton goods were shipped overseas, mainly to the then non-industrialised countries of south-east Asia, whose teeming millions depend so much on cotton for their clothing, her chief customer, by far, was India, while China and the Dutch East Indies were high in the list of importers

But this supremacy was doomed Cotton mills were erected in India, and, having the advantages of locally cultivated raw material, and an adequate supply of power and cheap labour, they ousted Lancashire cotton goods from the domestic markets A cotton industry grew up, too, in Japan, enjoyed the same general advantages as the Indian—one of the more significant being the excessively low wages and long working hours of the operatives—and flourished in the Indian and Chinese markets where they competed successfully with Lancashire textiles—the same markets in which they have competed in recent years with Indian manufacturers, more cotton goods for the home market were also produced in Chinese mills. Most of the loss of trade suffered by Lancashire was borne by that section of the industry manufacturing the coarser, cheaper cloths from the short-staple American cotton, for it was with these that their competitors, in particular in the Indian markets, were underselling Centres which manufactured the finer yarns and cloths from long-staple Egyptian cotton were less affected The net result was that in just over a decade after the 1920 boom, Lancashire had millions of redundant spindles and scores of thousands of redundant looms, as well as an army of unemployed cotton workers—a slump from which the industry never altogether recovered Great Britain has sunk to third place among world producers of cotton yarn, her output being about half that in the United States and well behind that of Japan, while she is not far in advance of India—the last pre-war year, 1938, was the worst for exports of yarn and piece-goods for over seventy years, cotton goods, however, still formed the country's most valuable export

Much less competition has been felt in the woollen industry, and Great Britain has long led the world in production, her position as principal exporter of woollen goods, too, has not yet been seriously challenged, for in addition to an established reputation in the markets, there is the advantage that three of the four main sources of the raw material are British Dominions, while the large-scale manufacture of woollens has not been developed to the same extent as that of cottons in the Oriental industrial areas Although the industry is less localised than cotton manufacturing in Lancashire, the spinning and weaving of wool have been associated since medieval times with the West Riding of Yorkshire—the sheep of the neighbouring moorlands provided fine wool, the streams and rivers a good water supply for scouring, when machines took the place of manual labour there was fuel in the nearby coalfield—so that in the narrow dales of this district numbers of towns, large and small, originated and grew up with the industry itself

Among these towns Leeds is pre-eminent, occupying a similar position, geographically and industrially, to Manchester Like the leading city of the cotton industry, it has more the character of a commercial than a manufacturing centre, and is also important in the wholesale clothing trade Besides the nearby alpaca works (using mohair) and velvet and plush mills, Bradford is Yorkshire's great worsted city, the wool-combing involves a complicated mechanical process, so that large-scale specialisation is essential Huddersfield is noted for its fancy goods, Halifax for its light fabrics and carpets, Dewsbury for its heavy fabrics and blankets, and Wakefield, Barnsley, Batley, and a number of other towns are engaged likewise on various branches of the woollen industry To the south, Leicester has always been renowned for its woollen hosiery, its natural advantages being a supply of high-class wool from the county breed of sheep and abundant coal from the neighbouring mines Scottish sheep, too, have played their part in the British woollen industry in the basin of the River Tweed such towns as Galashiels and Hawick have become famous for the fabrics called appropriately tweeds, though nowadays, of course, most of the wool has to be imported.

A small quantity of silk goods also used to be manufactured in Britain, chiefly in the Midlands, but the industry has continuously declined during the last few decades, firstly through competition from those countries which could produce their own raw silk, secondly through the invention and the rapidly assumed popularity of the much cheaper artificial silk This latter fabric, often known as rayon, is produced in such an attractive range that it must only be a question of time before it completely drives the true aristocrat of textiles from world markets, the newer synthetic material, nylon, is claimed to be stronger and more elastic than the real silk Manufacture of artificial silk is actually an offshoot of the chemical industry, and in the main it has become prominent in countries where the production of chemicals and textiles was well established The raw materials, which may be wood-pulp or cotton waste, are converted chemically into a cellulose jelly having a very similar consistency to the substance produced in the body of the silkworm, and this is then extruded through tubes of very fine bore, a number of filaments being combined—as in true silk reeling—to form one thread of artificial silk On the speedy development of rayon manufacture in Japan, Great Britain fell from second to third place in world production, by 1937 to fourth place, and in the pre-war years her increasing output was barely keeping pace with the general expansion in the industry, many of the towns already engaged in the cotton or woollen trade have also taken up the manufacture of the new rayon fabrics

On the more plebeian side of the textile industries, jute yarns and cloths are still principally manufactured in their original home, Dundee, whence they were introduced from Bengal, while Barnsley is the important centre in England For the raw materials of the leather industry the leading manufacturing nations, including Great Britain, are compelled to import from the less industrialised countries These raw materials consist chiefly of the hides of cows and horses and the skins of sheep, goats, and pigs, and are obtained from the areas where the animals are reared in large numbers, Argentina, Australia, New Zealand, and South Africa, a large proportion of the Indian exports is now received in the form of prepared leather. For the tanning a variety of vegetable substances, including quebracho extract from the Paraná-Paraguay basin in Argentina, is utilised, while for light leathers such as are used in the manufacture of gloves, chrome tanning, employing chromium compounds, is extensively practised A group of Midlands towns, with Leicester and Northampton as the best known, have become the centres of the British industry, and boots and shoes, gloves, and other leather goods comprise an important branch of the export trade

From what has been said of Great Britain's very limited share, apart from coal, of the world's natural wealth, it is plain that her economic prosperity must continue to rest on her manufactures Of these, the products of the iron and steel and dependent industries are of scarcely less significance to her overseas trade than the textiles Yet in recent years she has been no higher than fourth in world production, largely because the U.S A. and U S S R both have such vast domestic markets to supply, while Germany had the advantage of being more accessible to the continental markets, partly, too, because of the shortage of domestic iron ores It may be confidently expected that Germany's output, at least, will be exceeded for the first part of the present era of peace As we have observed, most of the iron is smelted on or near to some of the principal coalfields—in the North Riding of Yorkshire, South Wales, north Lancashire and Cumberland, the Midlands, and the Midland Valley of Scotland We may note, too, that a host of metal goods derived from the iron and steel industries, varying from heavy machinery to pins and needles, are produced in Birmingham and district and the neighbouring Black Country—so that the so-called "Brummagem ware" has achieved world renown, that the city of Sheffield is equally famous for its cutlery, tools, and other high-quality steel goods, and that machinery for the cotton and woollen industries is manufactured in the textile towns themselves

Then the construction of ocean-going steamers is so closely linked to Britain's position as foremost shipping nation that Clydeside rose to be the greatest shipbuilding area in the world Below Glasgow the banks of the river are lined with shipyards bearing world-famous names, and there are others at Belfast, in Northern Ireland, and along the Tyne, Tees, and Wear in the north-east In South Wales, especially at Swansea, tinplate is manufactured, Coventry and other Midland cities have become the centre of an expanding automobile industry, which, though on a miniature scale compared with the gigantic United States undertakings, is at any rate second in world output, the rich variety of local clays, with the assistance of local fuel, enabled the Potteries—Stoke-on-Trent and the Five Towns—to be one of the world's foremost centres of earthenware and porcelain manufacture, glass works, likewise consuming heavy quantities of fuel, are established on or near to various coalfields, alkali works near to supplies of salt, while the chemical industry in general, amalgamated into one company and producing such valuable commodities as fertilisers, dyestuffs, paints, soaps, and explosives, is quite widely dispersed In the post-war regeneration of the British export trade, most if not all of these manufactured goods, and many others, are destined to play the leading parts

Entering the field at a later date than Great Britain, Germany nevertheless became, quite soon, a predominantly manufacturing nation and a formidable commercial rival Apart from direct overland communication with the principal European markets, she had certain advantages in resources, especially prior to the territorial losses sustained through the Treaty of Versailles—though her foreign trade showed a similar dependence on imported raw materials and foodstuffs About the two major groups of industries based on ferrous metal and textile manufacture there were certain differences and certain points of resemblance Her iron and steel industries, similarly attached to the main coalfields, were located in part in the Saar Basin and Upper Silesia but were most concentrated in the Ruhr, a region as densely urbanised as Lancashire and the West Riding of Yorkshire Centred upon Essen, with Dortmund, Dusseldorf, and Duisburg important locales, they included the great Krupp and Thyssen works, which were so largely instrumental in effecting the Nazi rearmament of Germany Iron and steel, in fact, were much more prominent in the German foreign trade than they were in the British, and, whatever may be ultimately determined for the Ruhr heavy industries, it would be plainly uneconomic to stifle deliberately the geographical advantages of the region in proximity of raw materials and fuel, excellence of communications, as well as the high technical skill of local labour Within the Ruhr, as in the English Black Country, every type of metal article, large and small, derived from iron and steel was manufactured

Machinery was one of the most valuable of Germany's exports, in the production of automobiles she followed Great Britain, shipbuilding at Stettin, Hamburg, and elsewhere along the northern seaboard, and at Duisburg, enabled her to maintain the fifth largest mercantile marine in the world There was a much wider dispersal of the textile industries than in Great Britain, with Wuppertal, for instance, engaged in the production of all types of fabrics, just as Chemnitz was the Saxon Manchester, Bremen, as the chief market for raw cotton, was the Liverpool of Germany Largely owing to her progressive system of technical education Germany also held a leading place in the electrical and chemical industries, the latter being unified, as in Great Britain, into one great Trust—it was natural, in view of the fact that German chemists produced the first coal-tar dyes, that she should be first in output of dyestuffs, as well as of such important synthetic fertilisers as ammonium sulphate and calcium cyanamide Where fuel and minerals were scarce, as in the Munich and Nuremberg districts, the ingenious inhabitants first made toys and pencils with wood from the local forests, industries which later developed into the manufacture of small metal articles, such as electrical apparatus and instruments, which required little raw material—a close parallel to the Swiss manufacture of clocks, watches, instruments, and fine textiles

Another highly industrialised region of north-west Europe, though scarcely of the pre-eminence of the Ruhr-Lower Rhine area of Germany, lies on the coalfields of Belgium, a small but very densely populated country whose export trade again reflects the significance of iron and steel and textile manufacturing in the national economy For the former there is, in addition to domestic fuel, abundant iron ore close at hand in Luxembourg, to which she is linked by Customs Union, and Lorraine, local raw materials also originally supplied the woollen and linen industries, but the wool and flax are now largely imported One of the most valuable exports consists of diamonds, the rough stones being shipped from the Belgian Congo, the world's most abundant source, and cut in Antwerp.

Adjoining this region at the Franco-Belgian frontier is one of France's leading industrial areas, situated on her northern coalfield, though her limited fuel and power resources are so dispersed that the location of manufactures throughout the country as a whole is less dependent on coal supplies than on the proximity of raw materials and the accessibility of markets for the finished goods Iron and steel, machinery, and metal goods, for instance, are still produced at Le Creusot, their early home, where the great Schneider armament works were created, as well as on the northern coalfield and in the Briey basin of Lorraine Cotton and woollen goods are manufactured in the north, near to the ports where the imported raw materials are unloaded, the former also in Alsace, the Rhône valley has always been the seat of the silk industry and Lyons its principal centre, while the capital, Paris, like London, produces an immense variety of manufactured articles, in which clothing and luxury goods predominate

Italy, still more deficient in coal than France, had to import heavily in order to feed her industrial centres in the Po basin, but was able to reduce purchases by making admirable use of cheap hydro-electric power Milan, the rival of Lyons in silk manufacturing, obtains its raw material from silkworms reared on the Lombardy mulberry trees, but in recent years has largely transferred to the production of artificial silk, it is also a centre of cotton and woollen and heavy industries, while the automobile industry is located at Turin Deep in central Europe, on the plateau of Bohemia, lies the chief manufacturing region of Czechoslovakia, a country whose advanced state of industrialisation is indicated by the prominence among her exports of textiles and metal goods Prague, the capital, and Pilsen are both centres of iron and steel and cotton and woollen manufacturing, the latter being the site of the famous Skoda armament and engineering works, fuel being obtained from the coal and lignite deposits in the vicinity Bohemian glass, for which fuel, potash, and silicates are all provided in the Bohemian Forest, has long been held in high repute, while Pilsen beer and the products of the Bata footwear factory have become almost equally world-renowned On the European continent the only other extensive industrial area worthy of note, outside the Soviet territory, is the Polish portion of Upper Silesia, where iron and steel works were founded on local supplies of coal and iron ore.

NEW INDUSTRIAL AREAS

But it may well be found that a development of more profound significance to the world than the maintenance of the older manufacturing regions of Europe is the expansion of industries in Soviet Russia Its uniqueness lies in the fact that it is proceeding according to a predetermined scheme, that the industrial geography of this the largest single state in the world, occupying one-sixth of the earth's surface, is being rewritten at the dictation of its political representatives In brief, the purpose behind the Five-Year plans was, firstly, so to industrialise the U S S R as a whole that the country could become virtually independent of foreign manufactured goods, and, to finance the project, primary products—raw materials and foodstuffs—were exported, while British, American, and German technicians were imported and retained until a sufficient number of Russians were trained Secondly, this development was not to take place solely by increasing the output of the established industries, which had been concentrated at the so-called centre, the Moscow-Leningrad region, but throughout the Union in the localities most favourably placed for economic exploitation of power and raw materials, costly transport was thereby to be conserved This decentralisation would also benefit the outer territories, which in pre-Soviet days had been regarded as mere colonial appendages to the Moscow-Leningrad industrial core, as sources of cheap raw materials and profitable markets for finished goods

To some extent the first aim may be said to have succeeded, for the industrial far exceeded the agricultural output in value at the outbreak of World War II—the reverse of the position before the Revolution, though absolute self-sufficiency in manufacture has not been achieved At the same time Soviet Russia rose to a place among the foremost industrial nations of the world Her output of pig-iron was more than treble the quantity produced in 1913, and exceeded the British, and in 1938 she was third in world production of iron and steel, in cotton manufactures she was sixth (ahead of France), in woollens fourth (ahead of the United States). As a result of the second tendency, the *absolute* production of the older areas has been raised, but their *relative* importance with respect to the whole country has declined No longer are coal and metallic ores from the Ukraine, metallic ores from the Urals, raw cotton from Central Asia carried to the factories of the centre to be returned as finished goods to the primary producers, Krivoi Rog, the Donets basin, the Urals, the Kuznetsk basin have their own heavy industries, Turkestan and the Caucasus their own textile mills The Moscow-Ivanovo area is still the leading source of textiles, but no longer has the monopoly At the same time the cotton, machinery, and chemical factories of Moscow, the cotton mills of Ivanovo, the automobile and engineering works of Gorky, instead of relying entirely for power on Donets coal, are making use of the lignite of the nearby Tula basin, Leningrad, built on a swamp, far from a coalfield, and geographically favoured in the past only by being Russia's point of contact by sea with north-west Europe, now utilises electrical power from local peat and hydro-electric plants, and has important shipyards

In the Ukraine, apart from the basic iron and steel industries of Krivoi Rog and the Donets basin, tractors and agricultural implements are manufactured at Kharkov, beet-sugar is refined at Kiev, while other food products originating in the rich black earths of this region are prepared at numerous centres Outside the Ukraine, the collective farms have been further supplied with machinery from such centres as Saratov and Stalingrad, on the Volga, and Rostov, in the Caucasus, industries have been established on the Grozny oilfield, at Tbilisi, capital of Georgia, at Erivan, capital of Armenia, and elsewhere, in the Urals and the Kuznetsk areas, the old centres of Chelyabinsk, Sverdlovsk, Novosibirsk have enormously expanded, completely new cities like Magnitogorsk and Stalinsk have arisen In place of one, Soviet Russia now has five principal industrial areas, at the "centre," in the Ukraine, in the Caucasus, in the Urals, and in the Kuznetsk basin

Russian losses of industrial plant during the late war have been gigantic, more particularly in the Ukraine The Stalingrad and Kharkov tractor plants have been destroyed, along with an immense number of furnaces and factories associated with the metallurgical, engineering, and chemical industries When these have been repaired, her vast natural resources will enable the expansion and redistribution of industry again to proceed, in the main, no doubt, to provide an increasing supply of manufactures for the quickly rising population, and, therefore, not for a considerable time markedly affecting international trade

At present the United States has undisputed supremacy in industrial output, a position she has gained largely by virtue of her ample resources of fuel, iron ore, and other raw materials, and the enormous domestic market Yet she is less fundamentally an industrial country than Great Britain or even Germany—a much smaller proportion of her working population is engaged in the manufacturing trades, and it is significant that her two most valuable exports are still raw materials—cotton and petroleum By far the most highly industrialised and heavily populated area is a narrow belt stretching westwards from the Atlantic coast between Boston and Baltimore to a line joining St Louis and Milwaukee, a region whose towns all have the advantage of proximity and easy access either to the world's greatest trans-oceanic routes across the North Atlantic or the Great Lakes waterway With such a densely peopled region to be supplied with essential foodstuffs, it was logical that Chicago, possessing in the Corn Belt a rich agricultural hinterland as well as excellent railroad communications, should become the country's leading meat-packing centre, and scarcely surprising that slaughtering and meat-packing should comprise in value of products one of the two principal industries in the United States

Such a colossal slaughter of domesticated animals also assisted the United States to rise to first place in world production of leather, though millions of additional hides and skins are normally imported every year from the cattle- and sheep-rearing lands of the southern hemisphere Pennsylvania is the leading state, partly because of the local supplies of oak bark for tanning in the early days, partly because chrome tanning was first adopted in Philadelphia But leather is now manufactured extensively, too, in the meat-packing cities, and boots and shoes in St Louis and Milwaukee as well as in the older, eastern centres such as New York and Boston Another important group of industries is that associated with the preparation of various preserved foodstuffs, including patent cereal products from wheat and maize and huge quantities of canned fruit, vegetables, and other comestibles The canning of fruit is mainly concentrated in California, where most of the country's Mediterranean fruits are cultivated, the canning of vegetables and maize in the Corn Belt, and vegetables, again, in the north-east This industry has a close connection with the metal trades, for considerable amounts of steel must be manufactured for subsequent conversion into tinplate, from which the tinned containers or cans are then produced

With regard to textiles, the most noteworthy feature of the cotton industry in recent years has been the increased output from the Cotton Belt itself and the decline in relative importance of the New England states In the early days the latter had the advantages of accessible cheap water-power and later, coal, but competition from an area so much closer to the raw cotton, where cheap coloured labour was also available, proved too strong, and during the last two decades the south has continued to enhance its superiority At first the south-eastern states —the Carolinas and Georgia—specialised in the coarser fabrics, then this type of manufacture began to move westwards, closer to cheap power resources, and medium cloths were produced, now New England leads only in production of the finest goods Except in 1937, when the meteoric advance of Japan had enabled her temporarily to overtake the United States, the latter have also consistently led the field in artificial-silk production, the industry being located in New England and the New York-Philadelphia districts, in manufacture of woollens, however, she only takes fifth place

In the manufacture of iron and steel, in output of which the United States is well ahead of the rest of the world, the Pittsburgh-Cleveland district is most prominent good coking coal is mined close at hand, and iron ores are cheaply transported via the Great Lakes Other iron and steel areas, likewise favourably situated with respect to the Northern Appalachian coalfield and the Lake Superior ore deposits, are the district around the southern shores of Lake Michigan, including Chicago, Gary, and Milwaukee, various Pennsylvania centres as far east as Philadelphia, and, isolated in the south, Birmingham, Alabama Of the many machine-making industries which are such heavy consumers of steel, that which produces agricultural implements is of prime significance to a nation for whom farming is still one of the main occupations, it is principally located in the state of Illinois, on the doorstep of the agricultural Corn Belt In the boom year of 1929 about half of the output was exported, chiefly to Canada, Argentina, and Soviet Russia, but four years later this overseas trade had been reduced by ninety-two per cent, in the main because of the world agricultural depression, to a lesser degree because the U S S R was then manufacturing her own implements—a vivid illustration of the interdependence of agriculture and industry.

Manufacture of locomotives and rolling-stock is also of first-rate importance, for the country possesses about one-third of the world's total railroad mileage, while she is easily first in the production of electrical equipment and apparatus, largely in the New York and Chicago districts Perhaps the most remarkable offshoot of the steel mills is the automobile industry, in which the United

States overwhelmingly dominates the world, within her borders about three-quarters of the world's motor cars are owned, over three-quarters are produced Practically one-half of the automobile output is from Michigan, the heaviest concentration being located in the Detroit neighbourhood There and in the adjoining states the industry developed naturally out of the building of wooden carriages and wagons—often on the same premises and by the same firms, these having been set up within convenient reach of the nearby forests, to-day the situation is still favoured by the nearness of raw materials We may note here the vast output of automobile accessories needed for the manufacture of three to five million vehicles annually, and the existence of Akron, Ohio, often known as the "rubber capital of the world," with its immense production of automobile tyres and tubes In shipbuilding, however, the United States takes second place to Great Britain, in spite of the fact that her tonnage had increased by over three hundred per cent from 1914 to 1939 while the British had actually decreased, and in spite of the high proportion of her fleets plying the inland waterway of the Great Lakes This contrast between the two industries is a reflection of the emphatic domination of the internal trade in the American economy, and the British dependence on the overseas trade.

A country which, like Great Britain, is largely dependent on imported raw materials for the maintenance of its industries, though similarly possessing domestic coal resources, is Japan One of the principal objects of the recent Japanese aggression in the Far East, in fact, has been to secure a greater proportion of these raw materials within her own frontiers relief of the congestion of population, which had been growing at an embarrassing rate, was of secondary consequence, for the settlement of the Japanese people has never been conspicuously successful, even in such nearby territories as Korea The Japanese Empire consisted of the expanding outer zone, which, until Japanese ambitions extended to the whole of south-east Asia, included Korea, Manchuria, Formosa, Hokkaido, and Japanese Sakhalin, and functioned as the source of foodstuffs and raw materials to the inner zone of Japanese islands Meanwhile, the adoption by Japan of western methods of industrialisation has been remarkable, and very much by virtue of the low wages and long working hours of her workpeople she has been able to flood the world, and particularly the eastern markets, with cheap manufactured goods Often these were inferior to the products of other nations, as is usual during the early stages of industrial development, but efforts to improve their quality were beginning to take effect

Expansion was most noteworthy in the textile industries For years the principal Japanese import, prior to the war, was raw cotton from the United States and India, and the proportion of her export trade represented by cotton goods was continually increasing, while sales of raw silk, which had always dominated her exports, were slowly declining Osaka, the "Manchester of Japan" and the country's chief manufacturing centre, competed successfully with India and Lancashire in the Chinese, Indian, and other markets, and Japan became second only to the United States in the cotton industry During the depression years of the early 'thirties Japan, alone among the nations, actually extended her foreign trade But a more startling rise in output even than that of cottons, because of its suddenness, has been that of artificial silk, for which, again, Japan is much compensated for the relative difficulty of obtaining raw materials by the low cost of labour Between 1934 and 1937 her production was more than doubled, she temporarily became the leading nation, and her rayon was following her cotton fabrics into every quarter of the globe Imports of raw wool were also quickly mounting as more woollen mills came into production, for among the wealthier classes at least the customary practice of padding winter clothes was giving way to the wearing of woollen garments.

Throughout the Far East cheap Japanese matches had captured markets previously held by European products, the manufacture of chemicals, artificial fertilisers, glass, electrical equipment, and paper had become important industries, while Japan's output of steel, largely derived from Chinese ores and pig-iron smelted in Manchuria and India, and of machinery was rising at a rapid rate Even before their armies had overrun south-east Asia, Japanese manufacturers had sought to consolidate their position on the Chinese mainland by virtually controlling exploitation of iron ores, and in the field of textiles by the erection and ownership of cotton mills in Chinese cities It is patent, whatever territorial adjustments are now made to the former Japanese Empire, that the maintenance of her industries in the Osaka-Kobe, Tokyo-Yokohama and other regions is utterly dependent upon the accessibility of raw materials furnished by the United States, India, Australia, and China—including Manchuria, Korea, and Formosa It should be patent, too, that the standard of living, low though it may be, of a large proportion of the inhabitants of those densely populated islands is equally dependent upon that maintenance.

And what of the ultimate place of China among the industrial nations? There can be no dispute that her people will wish, and will be entitled, themselves to utilise their wealth of labour and natural resources for the supply of manufactures to the potentially immense home market Already the increasing relative importance of textiles in her export trade has provided evidence of the rising output of the numerous mills—though many were formerly owned by foreigners—in Shanghai, Canton, Hangchow, and other industrial centres Apart from the iron and steel output of Manchuria, there are blast furnaces and steel mills at Hanyang, on the right bank of the Yangtse near Hankow, fed by high-grade iron ore from Ta-yeh and fuel from Kiang-si, and admirably placed for river and rail communications Two significant achievements of the Sino-Japanese war were the formation of industrial co-operatives and the mass transference of plant, mainly from textile and chemical factories, into the interior by river junk, pack-animal, and porter India, too, besides the cotton mills of Bombay and the jute mills of Bengal, has iron and steel works at Jamshedpur operating on local fuel and ores and producing machinery, fertilisers, and other industrial by-products, like China, India has an enormous body of consumers awaiting the results of the country's growing industrialisation None of these Chinese or Indian centres, however, not even the Bombay or Shanghai districts, can attain the world significance of the main manufacturing regions of the eastern U S A. or north-west Europe until much further development has taken place

Of the younger nations which are also young industrially, Canada, with her rich stores of natural wealth, will see considerable industrial expansion beyond the relatively simple processes used in exploiting her forest resources for paper, wood pulp, and wood products, which have formed the bulk of her manufactures, being deficient in coal, the Dominion will continue to rely largely on hydro-electric power for this development.

Chapter 13

HIGHWAYS OF EXCHANGE

It now remains to discover *how* the distribution of goods takes place For conveyance over long distances the oceans provide the main highways of exchange, firstly because they occupy about three-quarters of the earth's surface, secondly because they enable the goods to be carried in considerable bulk and at relatively low cost This necessity for transportation in bulk is fundamental to modern international commerce It has been successfully answered by the construction of ocean-going vessels many times more capacious than those with which trade began timber, coal, even cement and clays can now be profitably carried hundreds of miles from their place of origin by sea, and, moreover, enable other cargoes to be brought on the return voyage at cheaper freightage rates. Usually these ocean steamers take the shortest distance between one seaport and another, on the longest routes via refuelling stations, the tendency on northerly or southerly journeys thus being to follow the meridians and on easterly or westerly journeys the great circles

Along the various well-defined trans-oceanic routes which have arisen, the heaviest traffic is to be found in the North Atlantic, between the eastern United States and north-west Europe, two areas that are rich in resources, densely populated, and the most highly industrialised in the world This, then, is the main artery of international trade, the channel along which passes the highest proportion of the world's wealth

On the European side stands London, which handles a greater tonnage than any other seaport Besides being the focal point of much of the British imports and exports, it is also pre-eminent in the heavy British entrepôt trade—particularly with the European continent It was its geographical position opposite to the Scheldt and the Rhine, in fact, which from early times assisted its development into one of the world's main ocean termini, other contributory factors were its establishment as the Imperial capital and the growth within its environs of a vast local market With Britain's second port, Liverpool, which grew up later and more especially with the trans-Atlantic trade and the rise of cotton and woollen industries in its hinterland, London is of overwhelming significance to the country's commerce If we were to give a simplified picture of the character of this commerce, we should emphasise the predominance of foodstuffs, particularly grain and meat, entering the two ports from the Atlantic, and of manufactured goods leaving them for markets scattered widely throughout the world

Antwerp, another of the world's leading seaports, is situated, like London, on a tidal river, and has the added advantage of connection with an extensive system of inland waterways Being conveniently placed near to the Ruhr and the lower Rhine, it handles much of the German transit trade, competing in this respect with Rotterdam During the Nazi regime the Germans attempted to divert this traffic to German North Sea ports, but with limited success Neither Rotterdam nor Hamburg enjoyed the natural assets of a situation like that of Antwerp, but the existence of a thriving hinterland has led to improvements in harbour facilities and enabled both of them likewise to rise to places among the first six seaports of the world Rotterdam is subject to obstruction by sediment carried down by the Rhine and the Meuse, but is connected by canal directly with the North Sea, in the transportation of the bulkier cargoes it is pre-eminently the port of ingress to the Rhine basin The importance of Hamburg to Germany has been enhanced by the comparative shortness of her North Sea coast; its extensive hinterland, accessible by rail, road, and waterway, covers the entire

Elbe basin and includes Saxony and much of Czechoslovakia

Second only to London in world trade is New York, so that of the six chief world seaports, five are located on the North Atlantic ocean routes four, London, Hamburg, Rotterdam, and Antwerp, at the eastern end, one, New York, at the western end Although the opening of the Panama Canal took considerable shipping to the Pacific ports, New York still dominates the American overseas trade, its early development was largely due to its position at the mouth of the Hudson River, the only deep waterway through the Appalachian Mountains Canada's principal Atlantic port is Montreal, one of the two points whence most of the Dominion wheat is shipped abroad, the other being Vancouver on the Pacific coast, Montreal has the disadvantage, however, of being closed by ice for about five months of the winter and early spring During this period the chief Canadian port is Halifax, Nova Scotia, which is usually ice-free throughout the year Lying practically on the great circle route from New York to Liverpool and nearer to Great Britain than New York or Montreal, and moreover possessing an excellent natural harbour, Halifax has failed to attain a major position because it lacks an extensive hinterland

Other important seaports near to the great industrial region of the north-eastern United States are Philadelphia and Boston, while New Orleans and Galveston on the Gulf of Mexico also take a share in the trans-Atlantic trade Continual dredging is necessary at New Orleans, but is compensated for by the spacious hinterland, to which the port is well served by railways, and by its favourable position with respect to Central America Thus much of its outgoing shipping carries raw cotton, and from its docks bananas and other products brought in from the tropics are distributed to all parts of the country A much smaller volume of North American commerce, but one that should be included with the North Atlantic routes, is that conducted with the Mediterranean countries, especially Italy And, briefly to review the nature of the trans-oceanic traffic between the United States and Europe, the first feature to strike us is the sustained predominance in American exports of raw materials, led by cotton and oil and to a lesser degree tobacco, the second is the diminishing significance over the last few decades of manufactured goods in the imports—betokening the still increasing industrialisation of the country

Traffic between Europe and the West Indies, Central and South America shows a much more simple exchange of manufactured goods for foodstuffs and raw materials Along the routes to South America, on which Madeira and the Canary Islands act as convenient refuelling stations, most of the shipping space is occupied by iron and steel goods and textiles From Argentina and Uruguay the products of the pampas, wheat, meat, wool, hides and skins, comprise the major outward cargoes, the leading seaports being the respective capitals, Buenos Aires and Montevideo Rio de Janeiro, capital of Brazil, has a more handsome and more spacious natural harbour, and handles the majority of that country's foreign trade, though more of the enormous exports of coffee now leave from Santos With regard to the intense rivalry that has existed in recent years between British and American merchants in the markets of Argentina and Brazil, certain points are outstanding Great Britain takes the bulk of the Argentine exports, and usually supplies more of the imports—though on occasion she has been superseded by the United States, on the other hand, coffee so dominates Brazilian exports that the United States takes an overwhelming share of the latter, and has held the lead in imports over the past two decades From Maracaibo, now the leading seaport in northern South America, the traffic mainly comprises tankers laden with oil from the Venezuelan fields A European seaport which takes much of the Brazilian coffee as well as United States cotton and tobacco and other trans-Atlantic commerce is Le Havre, it is France's premier Atlantic terminus and is also important in the entrepôt trade to the continent

Many Atlantic routes were considerably changed by the opening in 1914 of the Panama Canal, an event due to United States acquisition of a strip of land across the isthmus Owing to the fact that a ridge had to be crossed and locks constructed, it was a much more laborious undertaking than the cutting of the Suez Canal But all doubts as to its economic success were confounded within nine years, when for the first time the traffic actually surpassed that using the other great artificial inter-oceanic thoroughfare this in spite of its not actually shortening though providing an alternative to the European routes to Australia and the Far East To the United States, however, its value was immediately apparent—and not only from the strategic standpoint It put the industrial north-east into direct communiction with the countries on the western side of South America, and trade with Peru and Chile in particular vastly increased Moreover, it brought the country's Pacific ports into close touch with the Atlantic seaboard This proved to be by far its most important asset the bulk of the cargoes passing through, in fact, consists of raw materials being shipped from the western to the eastern states, the principal items being Californian oil and timber from the north-west Hence about one-third of the shipping using the Canal is of American nationality, whilst rather more than one-quarter is British

Down the eastern flank of the Atlantic Ocean, again, there is the route connecting Europe with the Union of South Africa One of the principal lines is from Southampton to Cape Town, the terminal point in South Africa being Durban, ports farther north along the east African coast are reached through the Suez Canal In addition to the direct trade with South Africa, vessels proceeding to Australia still utilise the route via the Cape of Good Hope, when speed is of smaller consequence than the

Suez Canal dues Of the two principal South African ports, Cape Town is admirably served by railways from the interior, leads in the export trade, about three-quarters of which is with Great Britain, and is the chief outlet for Rand gold and Cape wool

As far as the British Empire as a whole is concerned, a much more vital ocean highway is the "all-red" route through the Mediterranean to the East, particularly since about three-quarters of the Empire's population dwells in Asia and Australasia In addition to vessels of British nationality, which always predominate, streams of traffic from Hamburg, Marseilles, Genoa, and other European ports normally converge on the Suez Canal, which in effect links the Atlantic as well as the Mediterranean Sea with the Indian Ocean, and shortens the voyage from Europe to India and China by about 4,000 miles, Mediterranean ports benefited from the Canal by securing direct communications with the Far East, and so dispensed with much of the transit trade previously conducted through Great Britain Measuring eighty-seven miles through flat desert, the Suez Canal is thus nearly twice as long as the Panama Canal, has no locks, and is open to the sea at both exits. At the northern end is the great entrepôt and coaling station of Port Said, at the southern end the port of Suez Port Said affords an instance of a seaport engaged primarily in transit or entrepôt in distinction from domestic commerce, for most of Egypt's imports and exports are handled at Alexandria

A rich variety of cargoes is constantly filing through this narrow waterway, for the main part foodstuffs and raw materials from the east passing manufactured goods from the west, and in recent years the Canal has regained its position as the world's leading inter-oceanic channel, its volume of traffic diminished far less during the economic depression of the early 'thirties than did that of the Panama Canal, and in 1938 amounted to over 34 million tons, of which fifty per cent were British, against the 26 million tons through the latter Within the Mediterranean, Gibraltar and Malta act both as refuelling stations and as guardians of the British Imperial highway To France the route is almost as significant as to Great Britain, on account of its connection with her Far Eastern possessions, and Marseilles, her principal seaport and the only one of first rank on the Mediterranean, has a substantial trade through the Suez Canal Across the main stream there is also heavy traffic between Marseilles and the French territory in North Africa.

On their eastward course vessels steaming down the Red Sea pass through the Straits of Bab el Mandeb and reach the British fortified port of Aden, which, since the construction of the Suez Canal, has attained first importance in the entrepôt trade betwen Europe, Asia, and East Africa Here some of the traffic branches southwards to East Africa, some to Bombay and Karachi, but the more important part makes for Colombo, in Ceylon Protected from the full force of the south-west monsoon by a breakwater, Colombo has an excellent artificial harbour Besides being the island's capital and principal seaport, it has an extensive entrepôt trade, for here the eastbound shipping forks again into four distinct and much-frequented routes—to Calcutta, Rangoon, Singapore and the Far East, and Australia Singapore, one of the leading seaports in Far Eastern waters, is another busy entrepôt and refuelling station, built on the island of Singapore off the southern end of the Malay peninsula, it is linked with the mainland by rail and road, and is the chief collecting centre for Malayan rubber and tin But an even busier seaport is Hong Kong, which, in tonnage handled, often follows London and New York and is the only one outside Europe and North America to appear among the leading six Like Singapore, it is situated on an island, the fine harbour occupying the strait between the latter and the mainland, and is the entrepôt for trade with southern China

Across the Pacific the bulk of the traffic in normal times consists of United States trade with Japan, either direct from San Francisco and Los Angeles or through Honolulu, in Hawaii But the busiest harbour on the entire western coast of the American continent is that of Vancouver, which, at the terminus of one of the transcontinental railways, has substantial exports of prairie wheat as well as timber and minerals Besides its connections with the Far East, Australia, and New Zealand, it handles an appreciable amount of coastal shipping plying as far north as Alaska and via the Panama Canal to the Atlantic seaboard and Europe, and has superseded Montreal as Canada's first seaport—assisted, of course, by the fact that it is open throughout the year Most of Japan's imports of raw materials, in which American cotton and Australian wool figure prominently, and her exports of textiles and other manufactures pass through the two ports of Kobe and Yokohama Osaka, the leading industrial centre, is only accessible to vessels of small capacity, so that Kobe has become its ocean port, Yokohama occupies a similar position with respect to Tokyo Along with her trade with the United States and Australia, Japan, during recent years, has all but dominated the Chinese markets and acquired a notable share in those of India Much of the traffic to and from China has passed through Shanghai, outlet to the Yangtse basin, hitherto the country's most productive region in natural resources the importance of Shanghai having been increased by its position as entrepôt for the great river ports, including Hankow, Nanking, and Chungking, and also by the absence of a first-class harbour anywhere along the coast to the north Beyond Shanghai and Hong Kong, the routes from the American Pacific ports fork to Singapore—where heavy imports of Malayan rubber are loaded—and to Manila, capital and chief seaport of the Philippines

Along the world's ocean highways, of which only those of first importance have been mentioned, ships flying the

British flag have for centuries been in the majority This great mercantile marine was represented at the commencement of the second World War by a gross tonnage of nearly 18 million Yet her supremacy had slackened during the inter-war period, for while the British tonnage actually showed a decline, the volume of United States ocean shipping increased by over three hundred per cent, and, with the Great Lakes fleets, reached about two-thirds of the British total, a development stimulated largely by the fever of shipbuilding during the first World War By the 'thirties, however, there were signs that the United States had overstepped her normal needs in merchant shipping, for, with her concentration upon domestic trade, ocean transportation was less vital to her than to Great Britain, and her tonnage was slowly diminishing—a tendency which has been reversed again by the shipbuilding activity consequent upon World War II

Although between them Great Britain, the United States, and the British Dominions still owned nearly fifty per cent of the world tonnage, a striking change in distribution came with the quick and sustained expansion during the same inter-war years of the Japanese mercantile marine, which finally amounted to about one-half of the American This was the natural result of the geographical situation of Japan, her increasing industrialisation, and her dependence on overseas trade Fourth among the merchant navies was the Norwegian, which had also increased though to a less marked degree With a population less than one-twentieth of the Japanese, Norway had a tonnage not considerably smaller a reflection largely of the rugged, mountainous nature of the country, which through the ages has driven a high proportion of her men to seek a livelihood on the seas Of the other leading nations, Germany, formerly second to Great Britain, had been eclipsed after World War I, but was steadily building up her mercantile marine, and by 1939 had risen to fifth place, Italy and Holland—another nation with a large tonnage in proportion to her population—had considerably enlarged their merchant navies, while the French had somewhat declined

While the relative importance of many national merchant navies has altered, there have been much greater changes in the character of the shipping itself One inevitable result of the introduction of the coal-burning steamer has been the continuous decline of the sailing ship, which now represents only about one per cent of the total world tonnage At the same time considerable improvements have taken place in the size and speed of the steamships, especially in passenger liners, and the pre-war years saw British, French, and German shipping companies competing strenuously for the "Blue Riband" of the Atlantic Of late years, too, oil has partially replaced coal as fuel, for it occupies a smaller bunker space, can be handled by a smaller crew, and demands a shorter refuelling time Further evidence of the rising consumption of petroleum on sea, on land, and in the air was the construction of vast fleets of oil tankers, owned chiefly by British, American, and Norwegian companies Then the number of motor ships has rapidly increased, the tonnage rising from less than one-quarter million in 1914 to almost 17 million in 1939, the respective proportions of coal-burning and oil-burning steamships and motor vessels in the world total, in fact, became forty-five, thirty, and twenty-four per cent (gross tonnage, 1939).

ACROSS THE CONTINENTS

In order to reach the ocean highways by which they are transported across the world, goods must be carried overland from the source of production to the appropriate seaport, sometimes by *inland* waterway. This method of conveyance has the advantages that the actual haulage is relatively cheap, while extremely heavy loads can be taken, especially on such large rivers as the Rhine, where a train of barges frequently draws a cargo greater than would be accommodated by a railroad train But the disadvantages are more numerous Rivers, for instance, rarely flow in the most convenient direction for trade, many of the long rivers of northern Canada and the northern U S S R enter icebound seas far from ocean routes When they are slow they take a long, winding course, when they are swift they become unnavigable, often they must be dredged or canalised before they can be navigated at all, in the harsher climates they are frozen during the winter, unless linked by canals, they do not form a network of intercommunication in the way that railways do On canals, which are expensive to construct and maintain, the low speed of the traffic is still further reduced by locks

Nevertheless, the vast North American inland waterway system of the Great Lakes and St Lawrence River has become vital to United States and Canadian commerce, and the short connecting canals actually carry a far higher annual tonnage than either the Suez or the Panama Canal By its means small sea-going vessels may steam over 2,000 miles westwards from Belle Isle Strait, north of Newfoundland, to the ports at the head of Lake Superior, from these and other Lake ports cargoes may be conveyed to the Atlantic without break of bulk On the Great Lakes themselves, United States internal trade accounts for the majority of the traffic, coal and iron ore being the main cargoes, but there is also considerable transportation on the Canadian side, principally eastbound grain from the prairies, and between the two countries A scheme to improve this superb system still further entails the canalisation of the St Lawrence River so that ocean liners might steam direct to the Great Lakes, a project that would have a profound effect on the present ocean termini such as Montreal, as well as on the Lake ports On the American side the system is amplified by the New York State or Erie Canal and the Champlain Canal, which connect New York respectively with the Great

Lakes and the St Lawrence, via the Hudson River South of the Great Lakes, the United States have the longest natural inland waterway in the world in the Mississippi-Missouri system, the Mississippi being navigable from just below the Falls of St Anthony, near Minneapolis, to the Gulf of Mexico, its tributary the Missouri from the Great Falls, Montana But since the construction of the railways, the traffic has been relatively light, for the Mississippi has the disadvantage of a winding course and unstable banks, which sometimes cause disastrous floods, moreover, grains and other agricultural produce from the central states would inevitably deteriorate on the slow journey through the warm, humid, sub-tropical south

In examining the distribution of the world's wealth within the great land masses, it will be convenient to consider the complete inland transport system of each continent in turn About transportation in North America, one of the most impressive features is the density of automobile traffic In the United States alone about three-quarters of the world's motor vehicles are owned, and there are a number of good trans-continental highroads Road transport is important, too, in Canada By 1940 the long-projected Trans-Canadian Highway through Quebec, Montreal, Ottawa, and Winnipeg to Vancouver was completed, two years later the Alaska Highway through British Columbia and the Inter-American Highway through Central America extended the Canadian-U S road system to both Alaska and Panama Yet it is not the roads, but the railways, on which both countries have depended, and still depend, for most of their internal trade In most lands railways have been laid when the centres of population have been formed, in North America, on the other hand, the railways were the pioneers—they led the way from the east to the prairies, across the prairies to the Pacific, settlements followed in their wake and vast new stores of natural wealth were made available

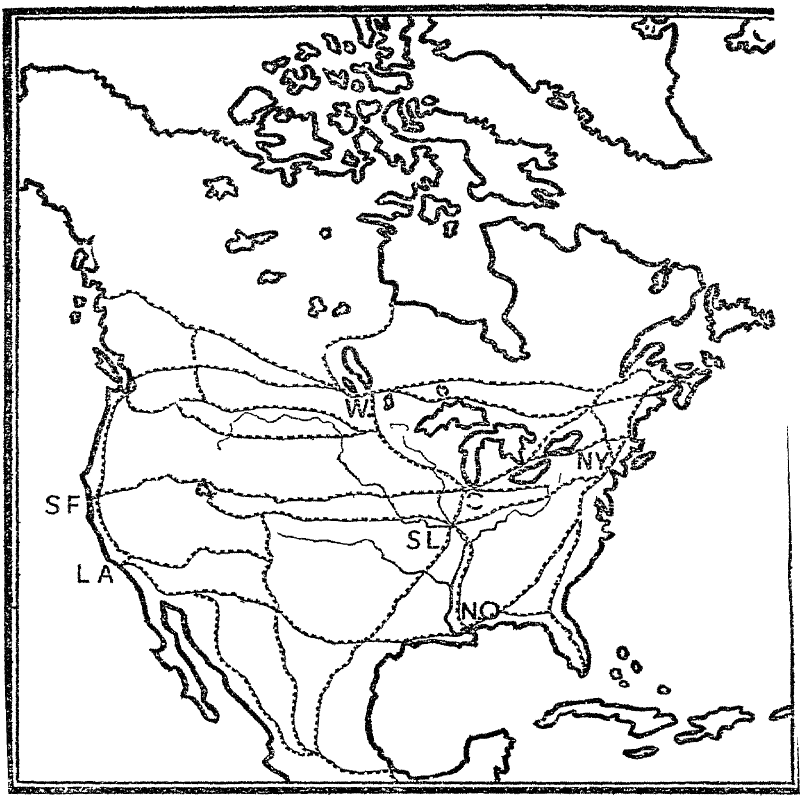
As the physical map so plainly indicates, the obstacles were considerable. In Canada, which has the shortest east-to-west route, the lines run south of the three lakes, Winnipegosis, Winnipeg, and Manitoba, and the networks across the prairies and from the eastern provinces thus both converge upon Winnipeg Then the lofty barrier of the Rockies had to be negotiated, and, in the United States, the Appalachian Mountains in addition Three main trans-continental routes traverse Canada, linking the eastern centres, Halifax, Quebec, Montreal, and Ottawa with Winnipeg, Edmonton, Calgary, and Vancouver, of these the southernmost, the Canadian Pacific line, is the most favourably placed for trade Wheat from the prairie provinces forms the bulk of the eastbound freights, while large quantities are now carried westwards for shipment from Vancouver In 1931 the railroad to Churchill, on Hudson Bay, was first used for exports of wheat, providing the shortest route to Great Britain, but a serious disadvantage is the icebound condition of the Hudson Strait for most of the year Canadian wheat farmers and United States wheat and maize farmers, in fact, rely almost entirely on the railways for the "bulk handling" and transportation of their grain

In the populous regions of the United States the railroad networks are far more intricate than in Canada, and with nearly a quarter-million miles of permanent way the country owns a greater mileage than the whole of Europe Along the four main trans-continental routes the characteristic, heavily laden, long-distance freighter trains illustrate the extraordinary importance of the railroads in internal trade Much of the Californian fruit harvest is sent eastwards by rail, while the bulkier products, such as oil and Washington and Oregon timber, are carried by sea through the Panama Canal, but the heaviest eastbound loads come from the agricultural region just east of the Rockies—animals for the Chicago stockyards, wheat from the prairies, minerals from the mountain states, and in the westward direction coal from the Appalachian fields, and manufactured goods from the industrial east On the Pacific coast Portland and Seattle in the north and San Francisco and Los Angeles in the south are connected directly with Chicago, New York, and other eastern cities, and it is noteworthy that so many of the main lines converge upon Chicago, the leading railroad centre in the interior A drawback to the transcontinental routes is the necessity of crossing the Appalachians and the Rockies, both of which have made long detours and steep gradients imperative One of the most profitable detours belongs to the "sea level route" from New York to Chicago leaving New York in a due northerly direction via the Hudson valley, the line does not swing westwards till 140 miles have been covered and the Mohawk gap reached—yet it carries a heavier traffic than the shorter line through Philadelphia and Pittsburgh By the interlacing of the northern U S lines with the Canadian network over several routes the trade between the two countries is immensely facilitated, and the railroad system of the North American continent as a whole further improved

In contrast, communications in South America are, save for one or two limited regions, in a backward state of development Throughout the northern part of the continent east of the Andes practically the sole means of transport is provided by the Amazon and its tributaries, and the only centres of life and trade in the interior are the widely dispersed river ports. The parent river is navigable from the Atlantic to the foot of the Andes, in the heart of Peru, and Manáos, 930 miles from the mouth, may be reached by ocean-going steamers Even so, the system is seriously impaired by obstructions along many of the chief tributaries On the Madeira, for instance, navigation is possible far above its confluence with the Amazon, but direct trade between Brazil and Bolivia is then prevented by over 200 miles of falls and rapids, and the section has been linked up by an isolated railroad These natural disadvantages, however, are yet of small consequence to world and even Brazilian trade, for since the eclipse of wild rubber, commerce through Manáos, the collecting centre of the interior, and Pará, the outlet for the entire region, has been on an extremely small scale, the more recent export of Brazil nuts is not likely to cause a profound impression in international markets[1] Marketable products from this vast Amazon basin are few and not readily accessible, and the population is sparse, and the main stimulus to possible future development of communications would seem to lie in the establishment of more rubber plantations. We should note, however, that in 1940 a plan was formulated for the settlement of Brazilian farmers in Amazonia, where they were to be given land for cultivation of rice, jute, and nuts, and that in 1942 an agreement was signed between the United States and Brazil providing for the development of the area and the expansion of output of rubber and other products

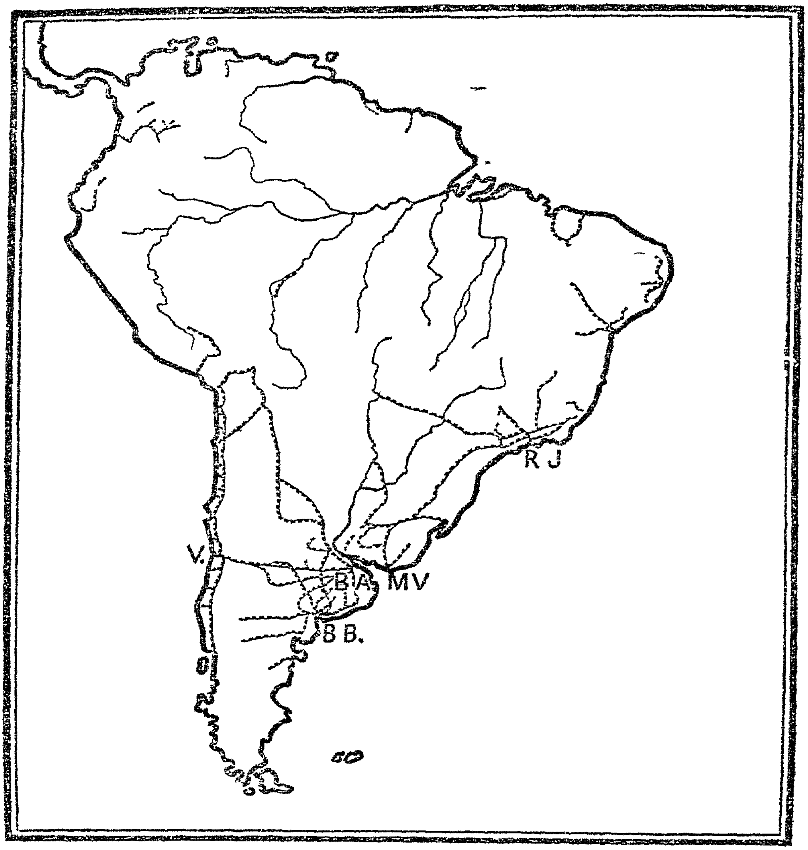
Apart from the Orinoco in Venezuela, which is navigable for some hundreds of miles, the only other significant inland waterway is that of the upper Paraguay and lower Paraná rivers Through its estuary, the River Plate, the Paraná is navigable to ocean steamers as far as Rosario, which thus acts as an important outlet for the agricultural products of the northern pampas, vessels of smaller draught may ascend to the Argentine frontier, and by the Paraguay River across Paraguay and well into Brazil

Railroads in South America are all but confined to coastal areas, and afford a remarkable example of piecemeal development Only Argentina has anything approaching an extensive system, the densest network radiating from Buenos Aires across the pampas—but even this suffers from the existence of three different gauges. In an environment where stone is scarce and roads are expensive, however, the Argentine farmers rely almost exclu-



The contrast between trans-continental railroad development in North America and South America (on opposite page) Only a minute fraction of the United States network is shown, and some of the national lines of Argentina and Brazil have also been omitted

sively on the railways for transportation of their cattle, wheat, wool, maize, and linseed to the coast There are direct routes, too, into Bolivia, and by train ferry across the Paraná into Paraguay—with a third line to accommodate the difference in gauges—while the railways in the north-east are linked to the Uruguayan system on the same gauge, but none of these connections except the last is of more than minor commercial significance Despite



her immense size, Brazil has a shorter railroad mileage than Argentina, and not a single line running completely across the country, her limited network serves the coffee and cotton plantations and the southern states West of the Andes a number of relatively short lines run down to the seaports and carry to them the minerals from the interior Chile now has a railroad covering almost the whole length of the country, but the main highway between the mining region of the north and the central agricultural belt is still the sea Once more internal trade is hampered by the mixture of gauges, of which there are no less than five, the "system" consisting of lines laid from the coast by various commercial interests

Inland waterways are of first-rate importance in the plains and valleys of northern Europe, especially in Germany, France, Belgium, and Holland, and the main rivers are intersected by a valuable system of canals, most of the leading seaports, in fact, stand at the mouths of these rivers By far the heaviest volume of traffic is carried by the River Rhine, the busiest river in the world, and of particular significance to Germany, for the banks are lined over much of its course with great industrial centres and river ports such as Duisburg, Dusseldorf, Cologne, and Mannheim, while its basin is hinterland to Rotterdam, one of the world's major seaports As far as Germany is concerned, its chief disadvantage is that it thus flows into Dutch territory in its lower reaches, but the attempt to divert its trade from Rotterdam to Emden via the Dortmund-Ems Canal met with limited success For well over half the year 1,000-ton barges may ascend the river as far as Basle, on the Swiss frontier, over 500 miles from the mouth, and improvements have enabled 2,000-ton barges to reach Strasbourg, the head of the main stream of traffic As on the other German rivers, the tonnage carried upstream normally exceeds that passing downstream, owing to the substantial imports of bulky materials like grains and metallic ores, manufactured goods produced in the Rhine basin are largely absorbed by the domestic markets, while many of those exported are taken to German seaports or by rail to Antwerp, and a high proportion of the cargoes borne down the river below Duisburg consists of coal and coke

Next to the Rhine, Germany's most important river is the Elbe, which is navigable from Prague and across the entire North German Plain, and is of peculiar value to Czechoslovakia in providing an outlet to the sea via Hamburg Although the Oder is also navigable from the south-eastern frontier to the port of Stettin, the volume of traffic is much smaller. Each of these three great rivers, as well as the Weser, flows in a northerly or north-westerly direction and Germany's principal canals, running in general from west to east, are designed to link them together, from the Oder they are also connected with the Polish river Vistula and the port of Danzig, and from the Rhine with the French system, her Baltic and North Sea coasts are linked by the Kiel Canal

All of France's navigable rivers, too, are linked by canals, the network being most dense in the flat, industrial country of the north-east Here a heavy traffic constantly passes along the interconnected French and Belgian waterways. Vast quantities of coal and iron ore are carried by the Marne-Rhine Canal, the most important in the system, which brings the Seine, and Paris, into touch with the Rhine valley, and has a branch leading to the Saar basin But the Seine is also linked to the Rhône by the Burgundy Canal through their respective tributaries the Yonne and Saône, and the Saône to the Loire by the Canal du Centre, Paris has thus become a centre of water-borne trade, and receives a substantial proportion of her goods by canal and river In the south there are the Canal du Midi, uniting the Garonne and the Rhône, and the Marseilles-Rhône Canal, so that France has unbroken lines of communication by waterway between her seaboards on the Mediterranean, the Atlantic, the English Channel, and the North Sea

None of the longer European rivers has yet a commercial significance approaching that of the German and French waterways Although the Danube, for instance, is navigable from Ulm, and serves seven different countries, its traffic is relatively light, its main defects being that it empties into the Black Sea, far away from the leading continental markets, is hampered by ice for about two months of the winter, and, below Budapest, is flanked by marshy lands unsuitable for urban sites Then Europe's greatest river, the Volga, has the disadvantage of draining into an inland lake, the Caspian Sea But the Soviet Government, with their unique problem of transportation, have determined upon utilising to the full this and other natural waterways—though they are still faced with the climatic liability that none of their river ports is ice-free for more than ten months of the year, most of them for much less Already the Moscow-Volga Canal, opened in 1937, has linked the capital with the Baltic Sea, while the earlier Baltic-White Sea Canal through Leningrad has brought it into direct contact with the far north, has assisted in the economic development of that region, and eliminates the long sea voyage between Leningrad and Murmansk, later, the construction of the Volga-Don Canal linked the Caspian with the Sea of Azov and the Black Sea, and the plan to establish Moscow as an inland port of five seas was achieved In Great Britain, on the other hand, where distances are so much shorter and an efficient railroad network exists, the rivers and canals have been in a state of decline for some years Apart from the Manchester Ship Canal, which is scarcely an inland waterway, the tonnage conveyed by British canals amounts to barely six per cent of that taken by the railways—against about twenty per cent in Germany

The industrial regions of Europe, generally, are served by complex railroad networks converging on such centres as London, Paris, and Berlin, and the trans-continental system as a whole has benefited by the adoption of the standard 4 ft 8½ in gauge, except in Spain, Portugal, and Soviet Russia In various parts of the continent the railroads were obliged to conform to the alignment of massive mountain ranges, which in some cases are still only partially conquered For long there was no line across the Pyrenees, the sole communication between France and Spain being round the western and eastern ends of the chain, while the main route from Paris to the Mediterranean was forced east of the Central Plateau and down the Rhône valley In Italy the Apennines provided a serious obstruction, in Central Europe railroad construction was prevented for hundreds of miles by the Carpathians Only over a long period of years and by extraordinary engineering feats were the Alps slowly vanquished by the cutting of long tunnels, including the St Gotthard and the Simplon —which connect the Swiss and Italian railroad systems and link the industrial region of northern Italy with those of Switzerland and western Germany—and the Mont Cenis, which joins the French and Italian railways

To a considerable degree the present relatively dense railroad network of Great Britain was encouraged by the physical structure of the country, for the only serious obstacles to construction were the Pennine Chain between the western and eastern industrial areas and the Southern Uplands of Scotland between the English and Scottish industrial areas, and even these were puny in comparison with such mountain ranges as the Alps and Pyrenees A salient feature of the lay-out is the way in which all the main lines radiate from London, and the position of other leading seaports as secondary focal points of the system an inevitable development in view of the dimensions of Britain's overseas trade Before the war, two direct links with the continental railways by train-ferry had been established, for the British system had been built throughout on the same standard gauge France's extensive railroad organisation likewise centres on the capital, by far the busiest line being that between Paris and the leading seaport, Marseilles

Communications in Spain and Portugal are, by contrast, poor They have been impeded in part by the numerous mountain ranges and deep river valleys with which the countries are intersected, in part by the general sparseness of resources and population in the interior In Italy, too, railroad construction was controlled to some extent by the mountains, though the passes through the

Apennines enabled the eastern and western coastal routes, which run the entire length of the peninsula, to be connected at various stages On to Italy's Plain of Lombardy converge all the important trans-alpine lines, and, in addition to the three tunnels already mentioned, the now historically famous Brenner route links this region with central Germany In view of Germany's position on the continent, with international routes passing into and through the country from west, south, east, and through Denmark, even from the north, and her industrialisation, it was natural that her railroad system should grow to a substantial magnitude, it grew to such an extent, in fact, that the mileage relative both to area and population is superior to the British At the same time, the system is much less centred on Berlin than the British system is on London

Two other leading cities of Central Europe, Vienna and Budapest, became prominent railroad centres in the days of the Austro-Hungarian Empire—the former because of its commanding position on the route from the Balkans via the Danube valley to southern Germany, the latter as the hub of the Hungarian plains As a result, the railways from the important industrial areas of Bohemia and Moravia converge upon Vienna, those from Slovakia on Budapest, while their modern capital, Prague, is starved of trade, and the Czechoslovak Republic as a whole is extremely ill-equipped with transport routes Yugoslavia, too, has a far from adequate railroad system, her two principal outlets to the sea being southwards through Salonika, in Greece, and the more desirable route to the Adriatic, through Trieste.

In northern Europe, railroad construction in Holland and Denmark has been impeded to some extent, again, by the physical features of the countries Holland is so lavishly furnished with natural waterways, however, and so many artificial channels have been cut, taking the place of roads, that the short railroad mileage, approximately half the combined length of rivers and canals, has not proved a serious drawback to trade Denmark is hampered by the division of much of her territory into numerous islands a disadvantage that has been partially overcome by the employment of train-ferries and the construction of bridges Except for the line from Luleå, in Sweden, to Narvik, the rugged, mountainous terrain of Norway has effectively obstructed the laying of railways in the northern part of the country, in the south, valleys have been utilised to link the western and eastern sides of the plateau—from Trondhjem to Oslo and Stockholm

But the provision of transportation is even more troublesome, as we have noted, in the U S S R , where immense distances as well as the usual physical obstacles have to be overcome One of the most serious checks to road and rail construction is Russia's river system, which compels the erection of many long and costly bridges While the waterways are being extended and increasingly used, however, numerous new railways have also been built, and the mileage has risen since the Revolution from 36,000 to 59,000 But in comparison with the British, German, or American railroad systems, the networks, even in European Russia, are extremely loose, to cover a territory nearly seventy times as expansive as the British Isles, the total length of lines is barely three times as great

Europe is linked with Asia by two important transcontinental lines, one leading to the Near East, the other to the Far East From Paris there are alternative routes to Istanbul, Asia Minor, and the Persian Gulf, the first running alongside the Marne-Rhine Canal to Strasbourg and then through the Balkans via Vienna, Budapest, and Belgrade, the second and shorter by the Simplon Tunnel through northern Italy and on to Trieste and Belgrade At the Bosphorus a train ferry connects Istanbul, the European terminus, with Haidar Pasha, on the Asiatic side, whence the Turkish line on the same standard gauge runs across the plateau to Nisibin, on the Syrian frontier, to

Mosul, and then, by a length completed in 1940, via the Tigris valley to Baghdad Beyond the Iraqi capital, the railroad to the Persian Gulf is at present on the metre gauge, but the intention is to convert this section to the standard

From Paris, too, runs the longest stretch of railway in the world, eastwards through Berlin, Warsaw, and Moscow to the Soviet Pacific coast and Manchuria and China, with a change to broad gauge on the Russian line Even before the Revolution her Trans-Siberian railway was of enormous value to Russia in promoting the settlement of her Asiatic territories, under the Soviet Government the railroad towns have expanded vastly, and traffic along the route has continued to increase Wheat from the Siberian steppes, butter from the dairy farms, and furs from the taïga form the bulk of the westward-moving freight, while machinery and other manufactured goods pass eastwards along the route After rounding the southern end of Lake Baikal, the line bifurcates, one branch turning south-eastwards across Manchuria—with another change to standard gauge at the frontier—to Harbin, where it is connected with a line to central and southern China, the other proceeding parallel to the border to Vladivostok A further line runs from the Vladivostok section direct to Harbin By a Soviet-Chinese agreement signed in 1945, the former railroad companies operating in this region, the South Manchurian and the Chinese Eastern Railways, are to be unified under the joint control of the two governments for thirty years, after which they are to be transferred to Chinese ownership

POVERTY IN TRANSPORT

Throughout the vast territory of China, the utilisation of the country's rich stores of natural wealth and her gigantic reserves of man-power has always been impeded by the poverty of communications Some development has taken place in road and rail construction, bus routes and airways have been established, and under a stable government progress will doubtless accelerate, but at present the chief forms of transportation over much of the interior are the human porter and the wheelbarrow Where mechanical transport is so inadequate, it is essential that the utmost use should be made of natural waterways, but here again the physical difficulties have proved all but insuperable, and only the Yangtse Kiang, the principal highway in central China, has been of major service for navigation This great river can be negotiated by ocean-going steamers as far as Hankow, and by smaller vessels to Ichang, being obstructed above this point by a series of rapids Most of the trade from Chungking, the river port of the province of Szechwan, however, passes by small boat down the Yangtse, progress is slow, and freight costs, despite the cheap coolie labour, are high Around the Yangtse delta a number of canals facilitate commercial intercourse, while northwards the Grand Canal, starting from Hangchow and crossing the Yangtse and the Hwang-ho rivers, runs 700 miles across almost the entire expanse of the Chinese Plain to Tientsin, which, standing on the Pei-ho, acts as river port to Peiping

Across the Plain, too, flows the Hwang-ho, the river that has been appropriately named "China's sorrow" Of little value for navigation on account of rapids and shallows, the Hwang-ho is capable of wreaking immense destruction to life and property by flooding—an evil from which the Yangtse is also far from free—or by a sudden change in its course over the Plain China's southern river, the Si-kiang, provides an important line of communication, but is likewise impeded by rapids

Although the country has nowhere any semblance of a network, and few other lines of any sort, there is now, at least, railroad communication between the north and the centre and the north and the south at Tientsin the line from Harbin branches to both Shanghai and Canton, though in each case interrupted at the Yangtse river, the

Hankow-Canton section of the route to the south having been completed in 1936, thus Canton is linked through Harbin and the Trans-Siberian railway with the main termini of north-west Europe. Hitherto, whatever progress has been made in railroad construction has been due chiefly to foreign enterprise. On the other hand, one of the principal factors militating against the creation of a national system has been the piecemeal development of certain areas by competing foreign interests, who obtained special concessions within their "spheres of influence"—a factor, however powerful, to which the new Chinese Government will no doubt give attention. Meanwhile, it was announced in 1945 that the United States had prepared a Five-Year plan for the post-war industrialisation of China, which included the construction of an internal transport system—a task which is now more urgent than ever, since the destruction during the recent war of many sections of her few railroad lines.

On her islands, Japan has an efficient railway system, but the only continental Asiatic country possessing even a loose network of lines is India. In contrast to the situation in China, the railroad furnishes much the most important means of communication, the rivers having thereby declined in value as transport routes whilst still being indispensable for irrigation purposes. Only in the Ganges-Brahmaputra delta, where the railway network is more open and the canals as well as the rivers are utilised, and up the Brahmaputra itself—still the leading highway to the north-east—have the waterways retained their former ascendancy. Road construction is simplified by the generally level character of most of the country, but progress has been hampered by the scarcity of materials, and good metalled roads are practically limited to the vicinity of the main towns and to areas where "feeders" to the railways are required. From the national standpoint a disadvantage of the railroad system is the employment of two different gauges, the broad 5 ft. 6 in. and the metre, the principal lines being built on the former, representing about half of the total mileage of 40,000, most of the branch lines on the latter, while there are also a number of mountain railways on narrow gauge Most of the main lines, of course, radiate from the leading cities and seaports, Calcutta, Bombay, and Madras, though the more densely populated regions, especially the basin of the middle Ganges, are also well served with secondary routes It is noteworthy that India, so effectively immured by lofty mountain chains, has no railroad contact with the outside world save by the obsolete line running across Baluchistan, which ends abruptly just within the Iranian frontier

Her neighbour, Burma, has a limited railway system which includes a line between Rangoon and Mandalay, and very few roads, and still relies for trade routes mainly on the Irrawaddy and its tributary, the Chindwin, timber from the tropical forests is floated down river to the sawmills on rafts, rice is carried along the narrow delta creeks to Rangoon in "paddy boats" Trade with China should be stimulated, however, by the existence of the now famous Burma Road between Lashio—linked by rail with Rangoon—and Kunming, in the province of Yunnan, which replaced the old mule tracks From Bangkok, capital of Siam, the railroad system is connected by a line running down the Malayan peninsula with Singapore, in Malaya, British enterprise has established an efficient network, while the French and Dutch have constructed more limited systems respectively in French Indo-China and Java

Inadequate though transportation may be throughout most of Asia, modern methods of communication have nowhere shown such slow development as in Africa—well named, by reason of the difficulty with which its interior has been revealed, the "dark continent" In the first place, its physical structure has caused many of the long rivers to be of little value for navigation in their descent from the high plateau which occupies so much of its surface, many rapids and waterfalls occur, thus obstructing waterborne trade for some distance from the coast. Of the four mightiest African rivers, the Nile, Niger, Congo, and Zambesi, the first-named is of greatest utility for navigation, and by providing a passage for steamers over a considerable portion of its course plays a signal part in the celebrated Cape-to-Cairo route—a trans-continental journey which can actually be made, without recourse to aviation, by using the services of railroad, motor road, lake, and river.

From Broken Hill, Northern Rhodesia, standing on an extension of the South African railways from Cape Town, a motor service and a railroad link up the steamship lines across Lake Tanganyika and Lake Victoria, the source of the White Nile. After the latter has been crossed, another railroad and motor service connect with the head of navigation on the Nile, then a long voyage is made by steamer down the White Nile to its confluence with the Blue Nile at Khartoum. From this point, where the Nile commences its gradual descent across the desert to the Mediterranean, its course is impeded by a series of rapids, known as "cataracts," which are unnavigable by steamers, and are circumvented by a railway running to Wadi Halfa. At the terminus of this line a steamer is again taken as far as Aswan, and the final stage of the journey is made by ail to the delta, either to Cairo or to the coast at Port Said or Alexandria.

Only at the two ends of this lengthy route through Africa s there a railroad system satisfactorily linking up the 'arious regions. Egypt has a network serving her rather mited area of dense population, and joining the agricul-ural settlements of the Nile basin and the principal cities o Cairo. But the greatest concentration of railways on the ontinent is in the Union of South Africa, whose fficient system is built on the narrow 3 ft. 6 in. gauge, an nstance of progress is the continued electrification of both runk and suburban lines, particularly in Transvaal and

Natal Lines run inland from all the main seaports, and the system is connected with South-West Africa and Mozambique, and northwards through Northern Rhodesia with Angola and Belgian Congo, the latter forms part of the most northerly trans-continental railroad line in Africa —from Benguella, in Angola, via Bulawayo to Beira, in Mozambique

That vast equatorial territory, the Belgian Congo, is extremely ill-served with means of communication, for even the Congo River, whose basin it so largely occupies, is severely hampered by rapids and falls Below a navigable stretch of nearly 400 miles on the Upper Congo, there are three series of obstructions, each circumvented by a parallel, isolated railway line, while another solitary line connects the Congo with Lake Tanganyika, the longest uninterrupted section lies between Stanley Falls and Stanley Pool, rather more than 1,000 miles apart, but its value is diminished by the rapids which then extend to Matadi, less than 100 miles from the mouth Of still less value as a means of transportation are the Zambesi, on which are the famous Victoria Falls, and its tributaries, many of the watercourses disappearing altogether during the dry season Next to the Nile, the most useful of Africa's major rivers is the Niger Hundreds of miles of its upper reaches are navigable, and below the rapids, which occur along its middle course, it renders central Nigeria accessible from the sea to just above the confluence of the Benue

From the coastal railroad which runs from Marrakesh, French Morocco, through Algeria to Tunis, several branch lines project southwards to the Sahara, a French motor service across the desert links these with the Nigerian railway, which runs to the Guinea coast at Lagos, and thus completes a north-south trans-continental route across north-west Africa As far as the economic development of the continent as a whole is concerned, however, the most pressing need is a number of trunk railroads joining the few coastal networks in the south, the north-east, and the north-west

A similar problem over the provision of adequate railroad communication confronts the Commonwealth of Australia no direct railway connection links north and south across the great desert of the interior, for a gap of about 600 miles still remains between the northerly and southerly sections of the line which is to unite Adelaide with Port Darwin There is, it is true, a trans-continental railway route running from beyond Perth, in Western Australia, more or less parallel to the coast through Adelaide, Melbourne, and Sydney to well north of Brisbane, in Queensland, but its value is considerably minimised by the various changes of gauge en route a situation which arose because each individual state developed its own railroad system according to purely local needs Both Western Australia and Queensland constructed their lines on the narrow 3 ft 6 in gauge, New South Wales utilised he standard 4 ft 8½ in gauge, Victoria the broad 5 ft 3 in. gauge and South Australia all three gauges, while the ong independent section between Kalgoorlie and Port Augusta on the Perth-Brisbane route is on the standard 4 ft 8½ in gauge In general, the different systems grew up around and radiated from the state capitals This attracted trade to the latter, and often enhanced their importance as seaports, particularly in the case of Sydney and Melbourne, but the increasing inter-state commerce has always been seriously impeded by the mixture of gauges, and Australian policy, as announced in 1944, is aimed at converting all lines—at enormous cost—to the uniform standard gauge In New Zealand, too, railroads were developed from isolated centres, but in marked conrast the value of a unified system was appreciated at an arly stage, and all lines were laid on the 3 ft 6 in gauge Another factor which hampered Australian railroad evelopment in the relatively populous south-east is the uperficial configuration of the country. the lofty

Australian Alps lying alongside the coast proved a stubborn barrier, and even now there is no direct rail connection from the seaboard to the interior between Sydney and Melbourne.

Except in the Murray-Darling basin, Australia is poorly assisted in transportation by her rivers, and even there the lack of water during the dry season is a serious disadvantage. Many of the longer rivers of the interior, which may have substantial watercourses during the rains, dry up entirely in the summer, others vanish into inland lakes. On the Murray and Murrumbidgee, however, an ambitious scheme completed in 1937, involving the construction of reservoirs and numerous weirs and locks, has furnished river navigation for well over 1,000 miles and has irrigated about 2,000 square miles of land. Nor is Australia well equipped with good roads, and for the most part they are no more than appendages and feeders to the railways. But much of the interior, flat and unimpeded by waterways, is accessible to the automobile irrespective of metalled highways, and the number of motor vehicles in use in Australia relative to population is practically as high as in Canada and more than twice as high as in Great Britain.

WORLD AIRWAYS

Finally, in our discussion of the world's commercial highways, we must briefly review the most modern of all, the airway — a means of transportation which has developed to a phenomenal degree over the last quarter-century, and did not cease developing during the recent world war. Though not yet utilised for the conveyance of the bulkier forms of merchandise, the land plane and the flying-boat are now firmly established rivals of the railway train and the ocean liner in the speedy, long-distance transport of passengers, mails, and goods of small bulk and high value, and, in fact, will be used increasingly for freight. Broadly speaking, there are two main classes of airlines—those which connect the large urban centres of well-populated areas, represented by the networks of Europe and North America, and those whose principal function is to reach places which are accessible only with difficulty or not at all by road or rail—such as in the outlying territories of Soviet Russia, the Far East, Africa, and Australia

In the first category, the United States has an intricate system of airlines connecting her principal cities and towns, the most important being the trans-continental routes from the eastern to the western seaboard But she completely dominates also the airways of the rest of the continent, especially since the elimination of the German companies which had been operating in various South American countries In addition to the east-to-west routes, American planes fly southwards from the leading Canadian cities, across the United States, then via Central America or the West Indies down the western and eastern coasts of South America to Santiago and Buenos Aires, they also make trans-continental flights between the last-named cities, from Lima through La Paz to Rio de Janeiro, from Panama along the northern coast of South America, and penetrate as far up the Amazon as Manáos

On the continent of Europe, Germany, long before the second World War, had gained a pronounced supremacy in civil aviation, and from Berlin air routes radiated in all directions, as far north as the northern capitals, Oslo, Stockholm, and Helsinki, as far south as Lisbon, Rome, and Athens, in the Mediterranean region the Italian lines had taken the lead Between Europe and America the French line through Dakar across the South Atlantic to Natal (Brazil) and on to Buenos Aires and Santiago will doubtless regain its pre-war importance, during the war tho Americans also established routes from the United States via the West Indies, Brazil, and the Gold Coast to the Belgian Congo, and across Central Africa to the Sudan and Egypt Whatever fresh routes between the two continents are developed, the most significant advance is the wartime erection of the "North Atlantic Bridge," the mass conquest of the stormiest and most difficult transoceanic passage, involving the construction of great air bases in Labrador and Newfoundland, and linking by regular services North America and western Europe, the two most highly industrialised regions of the earth

From the British standpoint one of the most valuable routes is that connecting the mother country with some of the far distant units of the Empire over the Mediterranean via Egypt, Iraq, and the Persian Gulf to Karachi, Calcutta, Singapore, and Australia Of equal concern to the French and Dutch are the practically coincident lines to their possessions in south-east Asia, French Indo-China, and the Dutch East Indies Great Britain has an Empire route, too, spanning the eastern half of the African continent from north to south, from Cairo to Cape Town, while France links up with her territories in north, north-west, and central Africa, and Belgium with the Belgian Congo Across the Pacific the United States in pre-war days had established services through Hawaii and other island bases to all parts of the Far East, including the Chinese interior, connecting to the Europe-Asia routes and completing the tenuous band of airlines that circumnavigates the globe Within the continent of Australia the aeroplane has been extensively utilised to link both the principal cities and towns and numerous remote centres which are not yet served by the railroad

But the value of the airway in reaching the least accessible regions has been most strikingly demonstrated in Soviet Russia, which, with a total of 68,000 miles of airlines, compared with 37,000 miles in the U S A and since said to have been substantially increased, was, even in 1938, claiming world leadership in the air transportation of freight To such an immense territory, in the main unimpeded by high mountain barriers, politically unified but poorly furnished with surface communications, aviation has proved an inestimable boon Besides the close network of lines emanating from Moscow, a trans-continental route leads more or less with the Trans-Siberian railway to Vladivostok and Sakhalin, with branches extending northwards to the Arctic, southwards to the farthest districts of Transcaucasia and Central Asia, and to Kabul, capital of Afghanistan, and Ulan Bator, capital of Mongolia, in 1941 a line from Moscow along the northern sea route through Archangel and Igarka to Anadyr, in eastern Siberia, was opened, to operate over most of the year

During the coming years, few centres of human habitation can remain long outside the range of the airway By its aid, new resources will be discovered and developed which, in addition to the mere conquest of distance, will be distributed to the benefit of mankind—to a degree that may well cause past achievements to appear puny Whether such progress will proceed by international co-operation or in limited national interests, one cannot, unfortunately, predict

Chapter 14

THE 2,000 MILLION CONSUMERS

SOMETHING has been indicated already of the effect of the location and distribution of world resources on man himself, as producer and consumer But the immense variations that exist in the share-out of these resources among the inhabitants of different regions may not have been always apparent To state that the world's wealth is inequitably distributed, even if we accept the broadest definition of what constitutes "wealth," is to stress what is obvious from a mere glance around our own social community, few of us, however, have the inclination or the opportunity to consider that there are members of the human race whose conditions of life are vastly poorer than any with which we make daily contact—a state of affairs that has been largely governed by geographical factors For man, like the resources he enjoys in such varying degrees, is still in some regions very much the creature of his environment In general, where civilisation has reached its highest level, man is least influenced by and most influences his geographical environment, there he is no longer the slave of his surroundings On the contrary, he aims at controlling and shaping them so that they shall provide him with increasing wealth, he enriches himself further by exchanging some of this wealth for the products of other localities In a primitive society, on the other hand his stock of wealth is limited to those resources of his immediate neighbourhood which he can gather for himself, and he is utterly dependent upon the beneficence of nature At this lower end of the scale of human progress are such peoples as the pygmies of the Congo jungle and the South African bushmen, who, spending their lives outside the pale of the world of international commerce, in the eyes of that world survive merely as anthropological specimens.

When the climate is so hot, humid, and oppressive as to discourage mental and physical effort, as in the equatorial forests of central Africa and the Amazon basin, any urge to economic activity on the part of the natives is stifled. geographical environment holds sway, and has often defeated the efforts even of civilised man at its subjugation. In the harsh climate of the polar regions the Eskimo, too, ekes out a hand-to-mouth existence on the few humble natural resources that are readily available. Around the margins of the hot deserts the nomadic tribesman wanders ceaselessly in the wake of the fitful rain, the rain that in some spots may not come for weeks, months, perhaps years, seeking food and water for the flocks on which his life depends. Is it so remarkable that he became traditionally a raider on settled agricultural communities, where in the last resort sustenance could always be seized from his fellow-man? And so, from the bottom of the scale of material welfare, man has ascended, by numerous gradations, to the condition of the dominant industrial nations of the intermediate zone, who have best succeeded in exploiting the world's wealth to their own benefit, and to the farthest degree have subdued their geographical environment.

Within each of the main natural regions, local environment, too, strongly influences the style of life that a man must pursue. If he is born a mountaineer, he will most probably follow a lonely career as shepherd or goatherd, while the plainsman either tills the soil or perhaps joins thousands of others in some industrial or commercial occupation in an urban centre. Where his land is rugged and infertile, he may seek a livelihood as sailor or fisherman, as so many Norwegians have done; where great stretches of arable soil occur, as on the North American prairies, his work is large-scale farming. He may happen to dwell near to a rich mineral deposit, such as coal, or iron ore, in which case he will earn his daily bread at its extraction Any such local factor, as well as the broader results of his regional environment, will determine the contribution he makes to the sum total of the world's wealth, and will profoundly affect his share in the consumption of that wealth—the food he eats, the clothing he wears, and the home that shelters him

Another effect of geographical conditions with which the prosperity of the individual is closely associated is the density of population in his area, here an important influence is exercised by rainfall, and there is a marked similarity in the location of areas of sparse rainfall and sparse population, for the simple reason that where moisture is absent vegetation cannot grow, food is not easily obtainable, and so the larger human settlements do not tend to arise All the areas in which mankind is chiefly concentrated, in fact, are regions which are well favoured with rainfall Among these, the heaviest concentration of all is to be found in certain parts of the monsoon lands of south-east Asia, where the land is coerced into supporting directly a greater number of human beings than anywhere else on earth—dense masses of mankind, in which the fortunes of each member are controlled from birth to death by the productivity of his own small patch of soil They are thus located chiefly in the fertile basins of such rivers as the Ganges and lower Brahmaputra in India, and the lower Yangtse Kiang in eastern China

Then the density is extremely high, also, in those regions of the cool intermediate zone where industry has succeeded agriculture as the main occupation, in north-west Europe—especially in such a highly industrialised country as Belgium and in parts of Great Britain and Germany—and in the north-eastern United States There, millions live by the manufacture of the world's raw materials and foodstuffs into marketable commodities, or by the commerce involved in such processes No longer primary producers, they depend for their food and clothing upon the surpluses provided by distant agricultural communities, their concenhave the most productive areas of Soviet Russia

Almost the only foodstuffs of which the country has need are those of tropical origin, and these are readily available in the Philippines and Hawaii, the neighbouring West Indies, and the states of Central America For, although the United States has not a colonial empire of the dimensions of the British, her economic domination of the countries of Central America, as well as many of those of South America, is absolute Then her intimate commercial ties with her northern neighbour, Canada, furnish still further supplies of essential raw materials With so much of the world's wealth held on her own soil, and nearly all else that she requires within the orbit of her control, the United States has become the Crœsus of the modern age—her *per capita* income well exceeds that of any other nation Among the countries nearest to her in the generally high standard of living of the inhabitants is Canada, likewise able, by virtue of her generous resources, to maintain a favourable trade balance still sparsely populated and only partially developed, a country of great potentialities and assuredly a prosperous economic future But in assessing the comparative luxury and comfort of the normal North American way of life, we should not ignore the fact that the United States has at least one serious domestic problem—the poverty of the negroes and poor whites of the cotton lands Are the wretched conditions of these less fortunate Americans to be relieved, is their standard of living to be lifted more nearly to the common level?

The specific problem of the American negroes, however, is not limited to the United States These descendants of plantation slaves form the majority of the population on most of the West Indian islands as well as in parts of the Cotton Belt. Yet among the whites it is held as axiomatic that the negroes shall not attain anything higher than a very inferior economic status, in recent years the poverty and distress among the negro inhabitants of the British

West Indies have become notorious, though with no more justification than similar conditions in the southern American states. Any further efforts that Britain may make towards improving the lot of her West Indian negroes will be followed with interest by the United States for its possible effect on the aspirations of her own coloured peoples.

Of the original inhabitants, the Indians, we may note merely that in the northern half of the continent they have been left far behind by the vigorous, machine-minded North American civilisation, and only in the thinly inhabited area of northern Canada, where they pursue the traditional life of hunter and trapper, do they form even a significant minority. In some of the Central and South American states, including Ecuador, Peru, and Bolivia, on the other hand, they still form a majority of the population. But, again, the standard of living of both the Indians and the mestizos, those of mixed Indian and European blood, is extremely low, and in marked contrast to that of the inhabitants of pure European descent. In any future scheme for the redistribution of the world's wealth their problem will stand with that of the negroes as one of the first to demand a solution.

Those South American countries which have been able to achieve a fairly high national income per head of population, Argentina and Uruguay, are significantly areas in which the Indians have been utterly engulfed by the flood of European immigrants, and form an extremely small minority. Prosperity came to these countries through the medium of the agricultural and pastoral products of the pampas, which the nations who supplied capital for their development, chiefly Great Britain and the United States, were eager to purchase, and the only areas in South America—in general a thinly peopled continent—which have a fair density of population are the regions around the River Plate estuary and the Rio de Janeiro district in Brazil. Yet even in these relatively prosperous lands there has been considerable poverty, due mainly to the method of employment of the peons or agricultural labourers At the present time South America as a whole is probably more securely within the sphere of influence of the United States than ever before—but to what extent will the interests which have promoted the exploitation of its minerals and foodstuffs now take a hand in the welfare of its submerged races and classes? As an example in 1942 an agreement was signed between the United States and the Brazilian governments providing for the further economic development of the Amazon basin, with special reference to an increase in the rubber output, will American enterprise aim at improving the lot of the poverty-stricken Amazonian natives, or of resettled Brazilian planters—or is the control of a natural rubber supply the sole objective?

Many a similar test of the intentions of the Great Powers will be settled on the continent of Africa, where most of the huge land mass, rich in resources, has been partitioned off by European Empire-building nations Scarcely any part of this vast area, from Tangier to Cape Agulhas, is, in truth, independent of European tutelage Much of the division of the spoils has taken place against the interests of the natives, who sometimes have been expropriated from the more productive soil and thereby further impoverished to the benefit of the incoming white settlers Separated from the negroid peoples of Central and South Africa by the geographic barrier of the Sahara, the Arab races in the north largely came under the domination of France and Italy French colonisation, maintained over a much longer period, has been the more successful, but the share of the Arabs of Morocco, Algeria, and Tunis in the natural wealth of their lands has been small, it has been exploited primarily to enrich France and the French.

Among the colonies peopled mainly by negroes, those inhabiting the British territories of Nigeria and the Gold Coast have been encouraged to some extent to participate in the economic development of their countries Elsewhere, however, both in West and East Africa white policy has frequently been injurious to negro interests, and in the past included such notorious instances of the inhuman exploitation of native labour as occurred on the Portuguese cocoa plantations of St Thomé and Principe and in the collection of wild rubber in the Belgian Congo, while in the rich and powerful Union of South Africa the colour prejudice is as strong as in the southern states of North America There the Europeans, who form a minority of about 2 millions out of a total population of over 9½ millions, hamper the economic progress of the natives by restricting their ownership of land in the agricultural areas and the type of labour they may perform in the industrial centres

But the most urgent problem before the British Empire with respect to the maldistribution of this world's goods is the relief of dire poverty among the 389 millions of India It has been computed that the actual wealth of the Indian people, based on its purchasing power, is below seventy per cent of the British, despite the fact that they are over eight times as numerous, in other words, their relative prosperity is about one-twelfth of the British, and a considerably smaller fraction of the American This is primarily a rural problem, for about two-thirds of the working population of India are engaged in agricultural or pastoral occupations Working usually on two or three acres of land, either as ryots or peasant proprietors, or as tenants, they pay land-tax either directly or through the landowner, often heavily mortgaged, their implements the wooden plough and the hand-sickle, sowing their crops broadcast and threshing by hand, their lives comprise a permanent struggle to fend off hunger Some progress has been made with the improvement in the strains of crops and of livestock, the railway system and irrigation schemes have helped to alleviate distress, but a great deal still remains to be done by the introduction of up-to-date implements, fertilisers, modern methods of agriculture, and the more comprehensive industrialisation of the country, for all too often widespread hunger has reached the proportions of a famine In 1943, the famine was aggravated, of course, by the loss of Burma to the Japanese, the normal imports of Burmese rice being thereby eliminated, the mortality was specially high in the rural areas

Even greater difficulties attend the relief of poverty in China, where about seventy-five per cent of the population of over 450 millions are peasants, settled on an immense number of smallholdings, so small that their mode of cultivation may be more correctly termed horticulture than agriculture, packed so densely together that sometimes as many as 7,000 people are scratching subsistence from a square mile of soil. This inordinate overcrowding, partly caused by the fanatical attachment of the Chinese family to its own plot of land, only augments the general poverty Sometimes famine is brought on by floods, sometimes by drought, and the lack of transport, the inadequate methods of irrigating and fertilising the soil, and often—as in India—the activities of the local moneylender, all help to intensify the suffering Chinese needs are obvious, and, in the spirit of national unity fostered by the war, the people have shown, by such achievements as the development of agricultural and industrial co-operatives, the completion of irrigation schemes, and the wholesale transfer of industrial plant from the Japanese areas by human porters, animals, and river junks, that given sufficient economic assistance those needs will be fulfilled Further progress was foreshadowed by the American Five-Year plan for Chinese post-war industrialisation.

In contrast to the extremely high density of population and the low level of material welfare in China, India, and the Dutch East Indies, Australia has a sparse population enjoying on the average one of the most elevated standards of living in the world Much of the desert interior is uninhabitable, but in view of the fact that almost half the population lives in the six state capitals, and that much of the vast tropical region is unsuitable for white settlement, there is plainly room for immigration Yet the White Australia policy, with the exclusion of coloured labour, is being maintained

A number of countries in south-west Asia, though nominally independent, have been merged into the sphere of influence of a European power, usually because valuable deposits of natural wealth have been revealed on their territory—wealth which has not noticeably raised the standard of living of the inhabitants Often oil has been the objective of foreign enterprise Oilfields in south-western Iran, for example, have been profitably exploited by Great Britain, though poverty, malnutrition, and disease have remained as widespread among the Iranian masses as anywhere in the Near East, Soviet Russia, meanwhile, seeks concessions in northern Iran Oil has also been the goal in Iraq Around this country's two great rivers, the Tigris and the Euphrates, were sited more than one of the most illustrious civilisations of the past, based on an agricultural economy, and well-conceived irrigation would bring prosperity again to the rich soil of Mesopotamia Yet the standard of living of the Iraqi peasantry has been calculated, on pre-war values, at less than one penny, or two cents, per head per day In Egypt, where Great Britain has also maintained military privileges on account of its strategic position on the route to India, the condition of many of the fellahin is scarcely less mean

Even in one of Europe's most extensive agricultural areas, the Balkans, the harshness of peasant life is appalling, a situation that could be immensely ameliorated by the improvement of methods, the heavier consumption of fertilisers, the utilisation of the potential hydro-electric power of the Danube basin By the introduction of large-scale mechanised agriculture Soviet Russia, on the other hand, has raised the living standards of her rural workers to an unprecedented level—though the mujik of Tsarist times was known to be the least productive of all the peasants of Europe and traditionally one of the most wretched creatures on earth Having embarked on and hitherto succeeded in ambitious programmes for the greater exploitation of her rich natural resources and for more comprehensive industrialisation, there seems no obstacle, once the wartime losses have been repaired, to a continued rise in the material welfare of her people, in comparison with the wealthiest nations, of course, their standards are still low

It appears to be now generally agreed that such maldistribution of the world's wealth as we have briefly reviewed must not be permitted in the post-war world, that acute shortage of the essential commodities of life must not co-exist with the improvident wastage and destruction of resources caused by an ill-adjusted world economy, that widespread poverty and hunger must not remain when greater riches than the earth has yet known await exploitation Probably this has been best expressed by the resolution of the Eighth American Scientific Congress, held in 1940 at Washington, D C , whose principal clauses are contained in the following quotation

—"*Whereas* Needless waste and destruction of necessary natural resources everywhere threatens or will threaten, sooner or later, the welfare and security of peoples,

—throughout human history the exhaustion of these resources and the need for a new supply has been among the greatest causes of war,

—the welfare of every nation requires natural resources which it lacks, and fair access to such resources from other nations is an indispensable condition of national welfare and permanent peace,

—conservation of natural resources and fair access to needed raw materials are stages toward the common good to which all nations must in principle agree,

—international co-operation to inventory, conserve and wisely utilise natural resources to the mutual advantage of all nations might well remove one of the most dangerous obstacles to all nations to a just and permanent World peace,

—The Eighth American Scientific Congress

—*Resolves* to recommend to the Governments of the American Republics the appointment of an Inter-American Conservation Commission co-operating with the Pan-American Union and representing all the Americas,

—that this Commission be charged with the duty of preparing an inventory of world natural resources and of formulating a general policy and specific programme of action to promote the mutual conservation and prudent utilisation of natural resources for the welfare of all nations, in the interest of permanent peace"

A number of declarations embodying the same principles have been made by statesmen and economists of various nations Meanwhile, the second World War has ended, the forces which sought to enlarge their own fund of human and material resources by conquest and savage exploitation have been defeated Immediate post-war events have indicated that many of the former subject races no longer acknowledge the complete racial superiority of the white or his right to wax rich on the produce of their soil and their labour, if they themselves are to stay at a mere subsistence level They have shown, too, that whereas not all the commercial buccaneers who searched the world for raw materials, markets, and spheres of influence have been chastened by war, some at least of the victorious nations are beginning to appreciate their responsibilities in providing for the economic progress of colonial natives At the present time the scarcity evolved out of war throws into more vivid relief than ever the unequal distribution of the world's wealth, the contiguity of desperate want and surplus riches But if there emerges from this situation the general recognition that it is wrong, and the determination that it shall be repaired, then soon, and for the first time in world history, the terms "peace" and "plenty" may become synonymous for every member of the human race

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